Behavior and Social Issues (2023) 32:560–582
https://doi.org/10.1007/s42822-022-00119-w

ORIGINAL PAPER

Constructing Global Climate Justice: The Challenging Role of Behavior Science

Mark A. Mattaini[1]

Accepted: 7 December 2022 / Published online: 18 January 2023

Abstract

At least 80% of the world's population has been significantly impacted by climate change; the most vulnerable around the world are already facing dramatic, severe costs due to emissions produced by wealthy nations. In fact, "climate change is not just an environmental issue—it is an economic issue, a social issue, a security issue, and, above all, a moral issue" (Freer-Smith et al., 2007, p. xiii; see also Shue, 2020, "Distant Strangers and the Illusion of Separation"). Despite decades of work, none of the current models for mitigating climate change offers a realistic route toward stable end-state solutions, even in the wealthiest nations, much less the world (Brooks, 2020; Bordoff & O'Sullivan (2022). Efforts to affect climate change have typically been viewed as the province of engineers and policy makers, but achieving timely and adequate cultural shifts as required to support global climate justice (GCJ), is a question of behavior, and thereby calls out to our science. Taking a constructional approach, behavior science is in a position to offer and construct conceptual and experimental tools for understanding, studying, and contributing to cultural systems that have the potential to lead to meaningful climate change responses. Drawing on what is known about (a) contingencies of reinforcement; (b) delay and probability discounting, and related levels of demand; (c) firmly embedded, widely established patterns of derived relational responding, (d) emerging conceptual models of strategic cultural-systems analysis, and (e) what is now known about the power of narrative, behavior science offers intriguing systemic possibilities for engaging in strategic, science-based social action supporting GCJ. Included in the possibilities explored here are community and societal interventions, policy advocacy, and other forms of activism, framed in behavior science terms. The paper ends with an example of how our discipline can contribute to climate change mitigation through narrative and activism supporting forests and other natural ecosystems.

Keywords Global climate justice · Climate change · Narrative · Global climate action

The author wishes to express sincere appreciation to Lyle Grant of Athabasca University for his valuable suggestions for material on narratives.

✉ Mark A. Mattaini
mattaini@uic.edu

[1] University of Illinois Chicago, Paguate, NM, USA

Global warming is a severely difficult target to address. Examining the most recent Intergovernmental Panel on Climate Change (IPCC) report (Bezner Kerr et al., 2022), Meyer (2022) indicates that "the path to avoiding the worst impacts of climate change requires something impossible. Well, not actually impossible, but exceptionally difficult to imagine" (para. 4). The United Nations General Secretary recently stated that the Earth faces a "catastrophe," and Hoesung Lee, chair of the IPCC, stated that the most recent IPCC report "is a dire warning about the consequences of inaction" (UN News, 2022, para. 1). Climate events in many parts of the world in 2022 have drawn a high level of attention. In a paper in *The Atlantic* entitled "Green Upheaval," Bordoff and O'Sullivan (2022) argue that, "As greenhouse gas emissions continue to grow and as extreme weather events become more frequent and harmful, the current efforts to move beyond fossil fuels appear woefully inadequate" (para. 1). Agreeing in part with Smil (2022) they continue, "Talk of a smooth transition to clean energy is fanciful: there is no way that the world can avoid major upheavals as it remakes the entire energy system" (para. 3). While the US Inflation Reduction Act is a real contribution, continuing population growth globally, a transfer of labor to poorly paid Asians willing to work long factory hours, and populations in Africa and parts of Central and South America eager to shift to a high-consumption mode of living just begin to capture current global realities. Even our best current efforts produce limited change: for example, production of hydroelectric power generates large emissions, and while less damaging, scaling up wind and solar is not without climate costs.

While efforts to affect climate change have typically been viewed as the province of engineers and policy makers, achieving the timely and adequate cultural shifts required to support global climate justice (GCJ), calls out for serious attention from our science. Climate action must be viewed as in part our problem, and our ethical and moral responsibility, in partnership with the many others with whom we must work closely to effect meaningful change. Strategic science-based social action offering opportunities for meaningful contributions to the struggles of the most vulnerable will be essential for shaping and supporting GCJ as outlined by Beresford-Kroeger (2021), Mattaini and Roose (2021), and Schlosberg (2004, 2007, 2014). Determining whether historical and current barriers can realistically be overcome through cultural shifts remains an open question. However, given that climate change is grounded primarily in human behavior, recently developed behavior science may be positioned to provide conceptual and experimental tools to support meaningful climate stabilization. Drawing on what is known about (a) contingencies of reinforcement; (b) delay and probability discounting, and related levels of demand; (c) firmly embedded, widely established patterns of derived relational responding that might be shifted through narrative; and (d) emerging conceptual models of strategic cultural systems analysis, behavior science offers intriguing possibilities, even while recognizing the depths and uncertainties of the challenges.

Global Justice Dimensions of Climate Change

Framing global warming as a behavioral problem is sobering, as behavior science has not yet converged around even partial solutions to the problem. As noted by Alavosius and Houmanfar, "Humanity is threatened by a problem of its own making,

and the behavioral pathways ahead are much less understood than the trajectory of climate change" (2020, p. 222). The impacts of interlocking social, economic, environmental, and ecological struggles, gravely compounded by climate change and cultural practices that limit sustainability, operate within complex matrices of interactional cultural systems.

The Natural Resources Defense Council (NRDC, 2021) states that "Though climate change affects everyone in some way, it's indisputable that its most negative impacts are borne disproportionately by certain groups: women, children, people of color, Indigenous communities, and the economically marginalized. Climate is a human rights issue" (para 12). On the first page of her 2020 paper "Aiding the Poor in Present and Future Generations," Hassoun (2020) notes that:

> Poor people are the most vulnerable, and the least able to adapt, to climate change. If we do nothing, climate change will probably kill hundreds of thousands of poor people (IPCC, 2007; Mayell, 2002). If poor people in present or future generations die as a result of climate change, that will change the size of the population in those generations as well as how people fare." (p. 214)

The impacts of climate change are emphasized throughout contemporary literature on global justice. In a detailed discussion of global justice, Brooks (2020) notes that "Climate change and its causes are not controversial. A global consensus accepts human activity is responsible for this change and its associated effects" (p. 241). Brooks further argues that based on all available data, even the combination of all current strategic options would be unable to produce a stable and sustainable end-state solution—one in which adequate, just lifestyles for all can be sustained. Something different is needed. Shue (2020) digs more deeply into the ethical challenges raised by climate change in his 2020 chapter "Distant Strangers and the Illusion of Separation", raising the questions,

> Do we here in the wealthy countries have any responsibility toward all the people who are strangers to us—in many cases, distant strangers, for who we have no reason to feel affection and whose activities and practices we may have no particular reason to care about—the vast majority of other people in the world? Do we here in the wealthy countries have any responsibility toward them with regard to climate change? (p. 260)

Given the interdependencies within and among current world populations, Shue argues for and elaborates on the moral responsibilities persons from the wealthier nations might have to distant strangers related to climate change, indicating that historically and currently "the distribution of the dangers bears no relation to the distribution of the benefits from the emissions that are causing the dangers" (p. 261). He argues that due to our causal responsibility for this situation, we carry moral responsibility to assist poorer nations in developing sustainable alternatives, since it would be unjust for wealthy nations to place the burden of addressing the transition out of carbon energy into alternatives "on the backs of the poor" (p. 266). These issues are grounded in behavior and culture, and as part of these global realities, our science therefore carries moral responsibility.

Cultural Systems Science: Taking the Science to Scale

Recent conceptual and technical advances in cultural systems analysis and the extensive expansion of knowledge related to climate issues suggest possibilities for the expansion of research and intervention supporting GCJ; the scale of the problem must be met by the scale of solutions. Historically, the basic behavior analytic framework focused on motivating (establishing and abolishing) operations, behavior, and consequences. That relatively linear model functioned very well for understanding much of animal and human action, particularly with the additional recognition that behavior may be influenced by multiple concurrent contingencies, as regularly noted in Israel Goldiamond's nonlinear behavior analysis model in which "behavior was understood to be a function of multiple intersecting contingencies" (Layng, 2022, p. 66). The integration of equivalence relations (Sidman, 2009) and derived relational responding (Hayes et al., 2002) into the field provided further opportunities for broader analyses, particularly related to verbal humans.

However, dealing with an issue as complex as climate change in a meaningful way, while recognizing the individual behavioral dynamics involved, requires expansion into systemic matrix thinking[1] (Noel, n.d.), involving processes like rotating multi-dimensional matrices. Recent advances in systems science (Mobus, 2022) can further contribute to this work, as will skills in complex modeling (Mattaini, 2021). Systemic matrix analyses and modeling offer new options for moving in meaningful ways toward climate justice. The Behaviorists for Social Responsibility's Matrix Project is a first effort toward such an approach, in which interacting motivating operations (including relational responding), contingencies, behaviors of multiple individuals and cultural processes are analyzed and integrated concurrently (see, for example, Seniuk et al., 2019, and Mattaini, 2013, for Matrix Project examples). A first sketch of such a matrix is also found in Table 3, discussed later.

A recent review of empirical research relating to sustainability in behavior-analytic journals from 1968 through 2019 uncovered 50 articles over the past 50 years, including a noticeable uptick in the last 5 years (Gelino et al., 2021; see also Gelino et al., 2020). The work reported generally focused relatively narrowly on individual or family behavior, or in-house experiments within organizations. Contemporary issues clearly go beyond the work done so far, particularly in terms of widespread (e.g., at the level of public education) or systems level engagement within geographic or governmentally defined regions. Some behavior scientists, however, have begun proposing or initiating research that could be integrated into larger system efforts. For example, Abrahamse et al., 2005, reviewed 38 studies of household interventions to reduce energy, generally by targeting individual behavior within communities. Alavosius and Houmanfar (2020) provided thoughtful, data-based recommendations that could support moving ahead with larger scale research. Bonner and Biglan (2021) have proposed a model for designing experimental evaluations of multisector community interventions

[1] Technically vector, matrix, and tensor analyses (https://galvanizeopensource.github.io/math-essentials-for-data-science/introduction.html).

to reduce emissions on larger scales. (It should be noted all of these proposals emphasize the need for meaningful levels of research funding). Current efforts, however, remain limited, in part because of limited attention to the dynamics of cultural systems.

Derived relational responding and related behavioral processes are relevant factors for supporting systemic change, both in terms of expanding widespread understanding of climate issues, and potentially for shifting values and perspectives that could support meaningful climate action at larger scales. For example, in many current societies (including the United States), there remains a sizable percentage of people who view climate change either as a fiction propagated by politicians working for their own advantages, or as a natural process that cannot be meaningfully influenced by humans. In most cases, dismissal of the current importance of, or the possibility of meaningful human intervention related to, climate is grounded in derived relational responding, often shared within people's social or political spheres. Once learned, shifting those relations is challenging. It can in some cases, however, be done, as noted by Rehfeldt and Tindall (2022, p. 66), indicating that while verbal relations cannot be unlearned, the functional contexts to which those relations are bound can be altered. More research on how best to operationalize such shifts is needed, but work by Dixon et al. (2003), Dixon et al. (2018), and Reed et al. (2022) offer examples of approaches for establishing competing relational responses, and for organizing escalating research processes moving from individuals to collectives. Levels of behavior can be influenced to a considerable degree by factors studied in behavioral economics (Reed et al.), including delay and probability discounting, and related levels of demand. Little research related to climate change has been done in these areas, in part because humans often direct their energy toward more immediate challenges that they believe they can realistically influence—demonstrating how delay and probability discounting can stand in the way of needed climate action and research.

Noting the importance of both experimental and conceptual analyses to understand and solve behavior problems, Grant (2011) noted that "the size and complexity of modern developed economies, for example, do not permit precise experimental analysis, but when they work with larger scale problems, behavior analysts have used plausible conceptual analysis as a basis for generating and selecting solutions" (p. 245) and that:

> In the absence of analysis, cultural inertia will bias solutions in favor of green consumption as a generalized solution strategy. By itself, green consumption is a flawed solution to climate change because it perpetuates or even accelerates economic growth that is incompatible with a sustainable culture. Addressing climate change requires an integration of regulatory, energy efficiency, skill-based, and dissemination solutions. (p. 245)

Grant also referred to Nevin's well-cited 2005 article titled "The Inertia of Affluence," noting that he had "analyzed this larger cultural issue from a behavioral perspective and concluded that the rich reinforcement of affluent societies has made their consumption resistant to change, leaving us with a problem that has

self-perpetuating features" (p. 245). Grant therefore emphasized the need for culture-based solutions, noting that:

> Many in developed nations are like Frazier, the misanthropic antihero of *Walden Two*, who was paradoxically incapable of enjoying the appealing world he had created because he was not a product of it. It is difficult and perhaps even impossible for many who know only a materialistic world to even conceive of an alternative. Making a nonmaterialistic world appealing is a matter of establishing and maintaining the effectiveness of reinforcers for behaviors that do not depend on fossil fuels and other limited resources. (p. 254)

The material that follows suggests that (a) narrative procedures as advanced in the work of Grant and others offers one approach, and (b) policy advocacy (perhaps supported and encouraged with narrative) offer options for shaping such a nonmaterialistic world.

Every Opinion Starts with a Story[2]

A set of potential culture-based solutions is described in Grant and Forrest (2020) in a chapter titled "Can Stories Influence Sustainable Behavior?" which built on previous work in the way narratives function as both fiction (Grant 2005) and nonfiction (Grant, 2007). Those authors argue for the power of narrative as a potential motivating operation drawing on interdisciplinary sources, and cite as an example the way Harriet Beecher Stowe's (1852/2006) *Uncle Tom's Cabin* induced cultural change: The novel led people to oppose slavery in part by bringing the details of the day-to-day horrors of the institution into people's homes (Reynolds, 2011). In our era, climate science has firmly established a data-based foundation linking human greenhouse gas emissions to the climate crisis, and suggests that mitigation technologies and practices may contribute to alleviating the problem. However, among those not steeped in scientific reasoning, abstract data often lack the motivational power to initiate mitigation behaviors (Dahlstrom, 2014). In developed economies, people are largely insulated and often alienated from the natural environment through the use of fossil-fueled technologies and other aspects of the built environment, but stories portraying interactions with the natural world can provide reconnection (Nanson, 2021). Otherwise useful scientific findings often portray relationships among events in nature in abstract forms that can distort those events, and can displace people's direct experience with them (Grant, 2012), thus impairing their motivational effects. Well-told stories can overcome both the insulating effects of technology and the displaced nature of scientific abstractions by bringing the story audience into contact with inspiring examples of real people who have engaged in specific behaviors that have mitigated particular aspects of the climate crisis.

Examples include illustrations of the successes of individuals and groups in personal journeys in reducing purchases of unnecessary consumer goods (Platt, 2021),

[2] *New York Times*

transitioning to lives of walking and bicycling (van der Zee, 2015; Williams, 2018), altering diets of greenhouse-gas-intensive meat, converting corporate manufacturing to renewable power (Chrzanowska, 2022; Shiber-Knowles, 2019), preventing fracking and its harmful environmental effects (Steingraber, 2015), and developing sustainable and adequate-yielding farming in developing nations (African Sisters Educational Collaborative, 2019). The efficacy of all of these types of specific mitigation strategies has been empirically established and advocated in the most recent IPCC report (Bezner Kerr et al., 2022), but such reports, while well written and appealing to expert policy wonks, rarely include adequately motivating examples of how individuals, operating on the ground of real-life experience, are working to alleviate the climate crisis.

Effective stories embody a challenge or obstacle a protagonist is faced with, creating what is subjectively experienced as a sense of drama. Will the challenge be met? Will the obstacle be overcome? In a good story the reader or listener of the story is motivated to learn more. In technical terms, the confrontation of a challenge or obstacle functions as a motivating operation, which creates an effective reinforcer, learning the outcome of the story (Grant, 2005). Further, especially if the protagonist in the story succeeds, the story readers or listeners can be drawn into the drama themselves: If the people in the story prevailed on their city to build protected bike lanes to allow their children to ride to school safely without carbon emissions, why can't we? Direct previous experience with community advocacy of bike lanes or community activism is not essential because the narrative supplies an adequate set of interrelated stimuli, responses, outcomes, capable of guiding the story consumer on their own path of activism through a process encompassed as a form of generalization, as an outcome of relational framing (Hineline, 2018).

Harnessing the ability of stories to alter and maintain individual and culture-wide behavior poses both challenges and opportunities. The master narratives in indigenous cultures have been myths that foster sustainable and respectful relationships between aboriginal peoples and their environment, both living and inanimate elements of which are seen as connected to humans in a familial relationship (Koger & Winter, 2010; LaDuke, 1999; Nanson, 2021). Historically, the sciences, including behavior science, have dismissed myths, sacred stories, and tales of folk wisdom as explanatory fictions. In the void created by this dismissal, the master narratives of the industrialized world became heroic stories of continual economic growth that cherishes material consumption and enrichment propelled by advances in science and technology (Korten, 2015). At a broad cultural level, behavior scientists are at a crossroads, at which they have an opportunity to reflect on what their discipline might bring to a new master narrative that motivates people to reduce their level of material consumption, pursue sustainable reinforcers, and augment the resources of the world's low-income populace to the level of what the IPCC report (Bezner Kerr et al. 2022) describes as decent living standards. Behavior scientists also need to integrate stories within their field as behavior-change tools on an equal footing with traditional methods such as introducing antecedents and consequences, recognizing that this demands new research methods appropriate to examining how stories change behavior (Crichfield, 2018). Clearly needed are increasingly sophisticated experimental evaluations of the value of narrative methods as discussed here; the

potential of these interventions needs additional rigorous investigation—and encouragement. Crichfield (2018) suggested methods connecting narratives, verbal behavior, and emotional responses, a suggestion that may be controversial but begins to operationalize such work. Measures of changes in behavior (verbal or otherwise) following a shared narrative experience within a group or population should be possible using group designs, and many interrupted time-series designs (discussed in the next section) could also be used to explore possibilities in an efficient and flexible manner.

Community Level Interventions

Bonner and Biglan (2021) note that "If one assumes that [Green House Gas] emissions are fundamentally driven by human behavior, it follows that communities of people are the most appropriate subjects for large scale interventions to reduce emissions" (p. 110). They organize their model into two primary areas: intervention components, and measurement and experimental evaluation. They begin discussion of components by determining which may be relevant to the community, and identifying controlling variables. They then, however, move toward identifying important values shared among many members of the community (shared relational framing) using recently developed measures, and then tailoring the components in ways that fit those values. As an example, the authors describe Bonner and DeLeon's (2021) Environmental Awareness of Responsibility Treatment Hierarchy (EARTH). EARTH scores have predicted the effectiveness of interventions to reduce gasoline consumption; Bonner and DeLeon suggest that the EARTH scale could be integrated into a smartphone application.

This is consistent with the recommendations of Fawcett (1991), who with collaborators has partnered with local communities to support public and community health for more than five decades. With the goal of enhancing effects, Bonner and Biglan (2021) suggest that "it is easy to predict that change efforts are most likely to be successful when developed emergently by those who will be affected by them" (p. 111). The model begins with contacts with influential people from multiple community sectors (e.g., government, schools, media), then cultivating coalitions within and among those sectors, action plans for each sector, and tests of those plans that can then be articulated and disseminated to all participants.

Bonner and Biglan (2021) report on a literature search supported by the Coalition of Behavioral Science Organizations for experimental evaluations of strategies for reducing emissions in communities; they found none, suggesting the critical need for additional funding and intensified advocacy to address that need. Experimental strategies for tracking the implementation and success of action plans in the Bonner and Biglan model take a direction different from the randomized-control trials (RCTs) that have often been used in community program evaluation. Instead, they argue for expansions of interrupted time-series designs (originally developed for work with individuals), in which multiple measures of dependent variables are taken during a baseline period, and are then continued during and after the planned actions are implemented (Kazdin, 2020). There are multiple possible variations, including a

return to the no-intervention condition, or staggered introduction of components in different sectors or communities. In some cases, the authors recommend objective measures of proxies of the behavior of interest (for example, gasoline sales rather than mileage driven). The examples given in the article are useful, as is the call to organize to advocate for adequate funding to conduct the kinds of research the authors propose.

Alavosius and Houmanfar (2020) indicated that under current conditions, important work for our science "is to identify effective ways to test policies, determine factors crucial to deployment, and convey solutions to policy makers for enactment" (p. 248). Much like Bonner and Biglan (2021), Alavosius and Houmanfar's particular focus is to begin with small-scale testing, followed by larger-scale assessment and transfer of research toward scalable policies proceeding at local levels, where key stakeholders may be relatively tractable. They suggest that stepped changes will begin to alter community norms and convince community members that change is possible.

Public Policy Advocacy

There is little doubt that much can be learned, and changes can be made, at very local levels (for example, neighborhoods, organizations or divisions of the same, or schools) that can help to shape and test sustainable practices. At the same time, public policy decisions at much higher levels than individual and local are essential to moving toward GCJ at anything like the required pace. Behavior scientists have long recommended to themselves to widely engage at public policy levels (Fawcett et al. 1988), and have sometimes provided examples from which others might learn (Watson-Thompson et al., 2008; Watson-Thompson et al., 2021). Nonetheless, we have not been widely engaged in this behavior, with the exceptions of supporting behavior analysis licensing, and funding for specific programs, particularly autism services. There are lessons to be learned from these successes, as well as contrasts with advocacy for GCJ. Leaders and activists within the behavioral community (and families) clearly had learned some of the strategic advocacy repertoires and advocacy tools discussed here. Collective advocacy for certification and licensure for behavior analysts, and development and funding for services for those on the autism spectrum, almost immediately advantaged behavior analysts, families, and organizations providing services. The reinforcers for such action are evident and often achieved relatively quickly: increases in income, improvement in child behavior and family relations, and improved program activities.

Contingencies experienced by activists working for GCJ may not be as immediate nor as contributory to financial stability, a probable reason why broader social action has not yet reached the hopes of 1988. Another is lack of education on these issues in academic preparation. Expanding such action may however be more effectively encouraged and shaped by narrative programs as discussed above, by participation in collective efforts (Ardila Sánchez et al., 2020; Mattaini, 2013), and by satisfaction with more distant outcomes. Such advocacy is clearly essential if our science is to contribute to global sustainability, not primarily by focusing on developing reports and position papers as is common, but rather by studying and then actively intervening in policy

decision processes (which emerge from matrices of contingencies and behaviors). Devlin-Foltz et al. (2012) indicated that "it is one thing to catalog meetings held, position papers drafted, and pamphlets distributed; it is quite another to demonstrate that these outputs resulted in useful policy change outcomes" (p. 581). This is our current challenge.

For our purposes, advocacy can be defined as efforts to influence public policy. The policy process has been conceptualized as consisting of four stages: (a) agenda formation, (b) policy adoption, (c) policy implementation, and (d) policy review (Fawcett et al., 1988); the process is often not linear however. Stages may in many cases intermix, overlap, and be repeated and refined over time (Baron & Hoeksema, 2021; Mattaini et al., 2020), but at the same time it is essential to be clear about where in a particular process behavior scientists and practitioners are operating, and what our goals are in each stage. As discussed in Mattaini et al. (2020), there are no well-controlled experiments persuasively demonstrating that application of one well-defined application of one advocacy repertoire will produce a specific policy change (outcome) more effectively than any other, much less rigorously demonstrating specifically targeted changes within the community (impact). Nonetheless, there are many available reports offering potentially useful examples of advocacy developed by behavior scientists and others, some with considerable social validity, as well as conceptual models grounded in well-developed behavior science (Mattaini et al., 2020, p. 394 and following).

One key requirement if behavior science wants to contribute to social outcomes and impacts related to climate justice is to learn a set of skills for reaching out to, and partnering with, decision makers, stakeholders, and advocates from other organizations who share our commitments. Such connections require an openness to sharing values and experiences, as well as working through situations where disagreements or competing values are present (Biglan, 2015). Particularly helpful for strengthening, practicing, and enacting these skills can be circle processes (Mattaini & Holtschneider, 2017). Circles (which are traditional to many indigenous and First Nations cultures) bring together relevant stakeholders with divergent perspectives, using a core set of structured practices and shaping interlocking contingencies to support collective planning and problem-solving. Work developed in the 1970s and following by Sheldon Rose (1977, 1998) on behavioral group work contributed to this approach.

Strategic Advocacy Repertoires

Advocacy as discussed here is directed toward influencing or supporting the actions (behavior) of specific decision makers (individually or collectively), and those with influence on those decision makers (and in some cases those with influences on those influencers, and so on) specific to targeted concerns. Effective advocacy is typically not generically focused; the more specific the action on which the advocates focus, the better the chances for success, all else being equal (Gandhi, 1945; Mattaini, 2013). Advocating for "peace" or "reduction of fossil fuel emissions," in general is unlikely to achieve the changes desired. On the other hand, targeted advocacy for a $15 per hour minimum wage, requiring the use of child car seats, or votes for a political candidate who demonstrates

commitment to specific climate related legislation has demonstrated real potential. A number of such advocacy repertoires are supported in the literature, including the 2-Minute or Elevator pitch—making your key points with your reasons quickly and interestingly (Lee, 2016). Similarly, Koger and Winter (2010) discuss the "foot in the door" approach, in which inducing a small seemingly insignificant behavioral step can later facilitate a more substantial behavior change. Specific advocacy actions (for example, "making the ask") directed toward specific actions (e.g., votes or policy statements) of specific actors or classes of actors, are likely to contribute to meaningful changes supporting overall goals like GCJ. Preparation of policy briefs (Demarco & Tufts, 2014; Wong et al., 2017) is a necessary skill (often requested by decision makers), as is the use of case-specific narratives—a successful approach I witnessed in obtaining funding for autism services from the Utah state legislature over 40 years ago. Engaging stories of the struggles of possible beneficiaries linked to accessible data presentations and handouts can often differentially engage differently oriented decision makers to fund adequate resources for child mental health from finance committee members (as in the Alaska State Senate somewhat more recently, Mattaini et al., 2020). Extended contacts and collaborations with policy-makers over time are also factors in influencing those in positions to make or support policy change (Baron & Hoeksema, 2021; Fawcett, 1991; Mattaini et al., 2020). There are times when the key decision makers include large numbers of citizens, or decision makers in many sectors within a community. This would suggest use of media, with a goal of shifting motivating operations—an excellent opportunity to test narrative approaches.

Strategic influence in advocacy typically relies on behavior change strategies grounded in persuasion or protest, although there are other strategic options (discussed below in the final section on nonviolent social action). The dynamics of persuasion in most cases occur through changes in reinforcers or shifts in relational responding. In the simplest of cases, advocates are in a position to subtly or directly offer or solicit incentives to key decision makers including financial (e.g., campaign contributions), voter recruiting, local or national media attention, or personal support. Shifts in relational responding are also often important, and can be encouraged, depending on the decision maker by, for example, providing persuasive data, media presentations, or personal narrative testimony from those affected by the issue at hand, to concretize the issues. Aversives and protest, discussed later, also sometimes have a place in advocacy, although with caution, and usually in combination with potential reinforcers. For further advocacy repertoire options, please refer to Mattaini et al. (2020).

Tools for Strategic Advocacy Analyses

Effective advocacy generally targets multiple decision makers, and often multiple groups of decision makers, who may play different parts in possible change, as well as multiple influencers involved with those decision makers. Often the advocate cannot access key decision maker(s) directly, or the advocate does not

have adequate resources, skills, or access to shift reinforcers or evoke changes in relational responding by the decision maker(s). There are several behavior and cultural analytic technologies that can be useful in such cases. The key is to determine first who the key decision makers are—for example, who can change the policy on homeless youth in the county (the seven county commissioners), or who can submit a revised climate action budget to the US Congress (much of the work is done by those leading specific government departments and corporate leaders, each supported by a full range of staff).

Backward, stepwise analyses beginning with the decision maker, then potentially through several levels of influencers (e.g., staff, community leaders, voters)—whoever is likely to get you through the door or influence the positions and actions of that decision maker—can then be outlined. A further question to pursue is who, at each level, may act to block the desired action, and those with influence with them. The next step is to explore how to shift reinforcers or relational framing for those influencers. Behavioral researchers and practitioners could be in a position to design, test, and implement procedures to encourage legislators to support climate change bills in state and national governments, but most have only limited knowledge of specific, timely policy options. Universities and community agencies could fill these gaps; students and graduates could then be in a position to effectively engage influencers who could help shape the behavior of legislators dealing with issues of concern (Mattaini et al., 2020). Shared excitement among advocates often results when such planning and potential action emerges from their efforts—"one fire kindles another" (Deming, 1971, 253–54).

Such analysis can rapidly become increasingly complex, but that is the reality of public policy advocacy. It is relatively easy to sketch the connections identified as an initial planning tool; more complex when multiple groups are active in the policy process. (Contingency mapping can clarify relevant variables in complex situations, as discussed and exemplified in figures in Mattaini et al., 2020). A relatively accessible tool (including for community members and non-scientists), originally developed by Kurt Lewin (1964), is force field analysis (FFA), an analytic method widely used in social science, community planning, and business (Kruglanski et al., 2012; Mattaini et al., 2020; Spier, 1973). The goal of FFA is to identify the major "drivers" and "inhibitors" that concurrently encourage or oppose the target action by the decision maker(s). While not as detailed as contingency mapping, FFAs offer an accessible approach for beginning an advocacy analysis, especially when some of the advocates are not behavior scientists.

Strategic Nonviolent Climate Action

Evidence accrued over more than 50 years strongly suggests that what we have been doing will not lead to GCJ (Bordoff & O'Sullivan, 2022; Smil, 2022). It is clear that developing and sharing reports does not constitute taking effective action related to these issues. Commitments made but not kept will not produce GCJ. Competing

reinforcers for individuals and collectives are powerful; the behavioral demands required to live a truly sustainable life and cultures consistent with GCJ may initially be experienced by many as extremely aversive (think, for example, about the challenges involved in reducing global air traffic for behavior science conferences). While there is some evidence that episodic future thinking (EFT, Lin & Epstein, 2014; Stein et al., 2016) or future thinking priming (Shevorykin et al., 2021) can moderate delay discounting, the studies that have been done in that area dealt with much more limited behavior over much shorter time frames than what would be required for approaching GCJ. Small studies of community-level work have some potential to shift some behavior under some conditions, but such studies will not result in global climate action quickly enough.

From the author's perspective, the most realistic option with a genuine chance to act at a cultural level (especially if supported by meaningful narrative) is powerful action grounded in the collective exercise of strategic nonviolent power (Mattaini, 2013).[3] A serious social movement, primarily developed, initiated, and sustained outside of government over an extended timeframe will be required to operationalize such collective action. (Governmental personnel may, however, support such movements outside of their normal responsibilities —as allies.) The good news is that a science of nonviolent struggles has been shaped and tested over many years (Chenoweth & Stephan, 2011; Gandhi, 1945; Mattaini, 2013; Schell, 2003; Sharp, 2005). There is no guarantee that such an effort (most likely implemented by constellations of different action groups) will be powerful enough to meet the needs—the climate crisis is that severe—but without powerful activism, it is extremely unlikely that meaningful advances toward GCJ can be expected. This is the place of cultural systems analysis.

As discovered by Sharp and Raqib (2010), who have worked with nonviolent action movements around the world since the second world war, three types of knowledge are required to manage effective nonviolent struggles:

1. Knowledge of the conflict situation, the opponents, and the society and its needs,
2. In-depth knowledge of the nature and operation of the technique of nonviolent action, and
3. The knowledge and ability required to analyze, think, and plan strategically.

In our case, requirements include extensive familiarity with the facts of climate change locally and globally, study and practice in nonviolent action campaigns, and analytic ability (for which behavior *analysts* should be well prepared). Sharp and Raqib's extensive research indicates that considerable preparation for social action is essential, including learning and working with others with extensive related history and training—from multiple disciplines and communities.

A great deal is known about effective organizational structures and leadership in activist groups (Mattaini, 2013, chapter 6), and the need for the solidarity, discipline, and courage required (Mattaini, 2013, chapter 5). Ten behavioral guidelines

[3] Which is to say, it appears that Greta Thunberg is basically correct; the world cannot achieve GCJ without extensive change, emphasizing collective action as a primary commitment.

Table 1 Ten guidelines for strategic social action (from Ardila Sanchez, Cihon, et al., 2020)

Guideline 1. Be an Ethical Activist: An Active and Ongoing Process
Guideline 2. Actively Observe, Learn, and Engage with Local Values, Communities, and Environments
Guideline 3. Explore Individual and Cultural/Collective Relational Responding Relevant to the Current Situation
Guideline 4. Complete Situation-Specific Cultural Systems Analysis
Guideline 5. Clarify and Refine Overall Strategic Goals for the Current Situation
Guideline 6. Consider and Collectively Select Strategic and Tactical Options
Guideline 7. Mobilize—or Organize?
Guideline 8. Support the Development of Effective and Sustainable Collective Leadership
Guideline 9. Encourage and Sustain Solidarity and Discipline
Guideline 10. Shaping Courage: "Standing in the Fire"

identified for strategic nonviolent action identified are shown in Table 1 (with explanations in Ardila Sánchez, Cihon, et al., 2020). A great deal of activist effort across many issues has been wasted due to failure to follow these guidelines. As one example, the Occupy movement that began in 2011 rallied many thousands of people in the US and elsewhere (Hedges & Sacco, 2014) but did not adequately address a number of the guidelines listed here, particularly 5 (strategic goals), 6 (selecting strategic and tactical options), and 8 (developing effective and sustainable leadership). Although initially widely seen as a promising sea-change, the movement largely failed for those reasons.

Many activist groups are not aware of the many options available to address the full range of possible strategic challenges. Protest is commonly the first choice made, but there are actually hundreds of possible strategic choices (McCarthy & Sharp, 1997). Six major categories of such actions are listed in Table 2 (Mattaini, 2013). Persuasion has been discussed in the Policy Advocacy section; some degree of persuasion at key moments is common in nearly all forms of social action that move toward negotiation. Disruptive noncooperation involves in some way "breaking" the regular operation of the opposition systems; examples include strikes and boycotts. By contrast, constructive noncooperation generally involves building an alternative system to challenge the usual actions of a system. Two examples would be communities that decide to ally to prevent youth violence (thus limiting the need for police intervention and violence), rather than relying primarily on heavy policing (Mattaini & Rehfeldt, 2020; Roose & Mattaini, 2020; Watson-Thompson et al., 2020);

Table 2 Nonviolent strategic options

1. Constructive noncooperation
2. Nonviolent persuasion
3. Nonviolent protest
4. Disruptive noncooperation
5. Disruption of essential or facilitating resources
6. Retaliation

or providing informal alternative medical assistance to people who are treated badly by the formal system (has often been done within queer populations). Such alternative programs can in some cases lead to reforms by formal governmental agencies. Powerful methods are likely to be needed to shift well-established cultural practices, however.

Other possible strategic options include nonviolent protest, which generally presents either an opportunity for the target to escape from an aversive situation, or to escape the threat of such a situation. Behavior scientists are generally well informed about this option, which in constructing climate justice has in some cases proven powerful, but must be part of a balanced assessment as it is likely to evoke an aversive response to this aversive approach. Another option is disruption of essential or facilitating resources (e.g., blocking roads or employees walking out); this is not currently a common strategy for constructive responses in the case of climate change, but if linked with protest (and perhaps persuasion), it may sometimes have a place in activism. The final of the six strategic option is retaliation—fighting back violently. This demonstrably and typically results in undesirable results, and almost certainly has no place in GCJ advocacy. For more information on these additional options, please see Mattaini, 2013.

An Example: Climate and Forests—Constructing a Relational Matrix

Researchers at the Centre for Nature-based Climate Solutions, and Department of Biological Sciences, National University of Singapore (Koh et al., 2021), indicate that:

> Nature-based solutions could contribute substantially to climate change mitigation. These solutions include the protection, restoration, and improved management of forests, wetlands, grasslands, and agricultural lands to increase carbon dioxide sequestration, reduce emissions and enhance climate resilience. Protecting and ensuring the health of natural ecosystems are also important for conserving biodiversity, providing clean air and water, safeguarding food security, and sustaining livelihoods. (p. 2)

In this final section, we use as an example the contributions that forests (and other natural ecosystems) can provide for climate change mitigation (Freer-Smith et al., 2007; Rudel et al., 2020), using matrix analysis as modeled by Biglan (1995) and Mattaini (2013), to integrate (a) the behavioral connections among key players, (b) practices and behaviors consistent with goals, (c) practices and behavior in opposition to goals, and (d) relevant or potentially relevant incentives, disincentives, and facilitating conditions consistent with steps toward identified goals. (This approach can be applied in advocacy work around many climate issues; forest advocacy is used here as one example.) Activists and scientists have asserted that maintaining and increasing forestation is an essential and primary key to interrupting climate change (e.g., Beresford-Kroeger, 2021; Jensen et al., 2020) for example by encouraging a "trillion trees initiative." The realities are more complex (Hausfather, 2022), and the need to reduce carbon emissions is greater than forests alone can provide, but conservation interventions that

safeguard carbon stocks and biodiversity in vulnerable forests must be prioritized as a key global focus in climate change efforts (Freer-Smith et al., 2007; Koh et al., 2021).

We encourage readers to outline a relational matrix that might guide a local or larger program working to protect or enhance a particular forest ecosystem (or another area of advocacy interest). Table 3 provides an example of a partial matrix analysis (the original included 12 sectors) developed to plan for engaging youth in activism (Mattaini, 2013; see also Aspholm & Mattaini, 2017). Similar matrices should be developed to include as many key players as possible, individually or as groups. This is just one example; every activist plan will be unique, and should be developed collectively to fit the local or regional situation. (The example in Table 3 shows only examples of potential incentives; facilitating conditions and disincentives can be listed in separate columns for clarity, or included with different coding or colors in the same column as incentives to simplify presentation.)

Data from this table can be used to construct an integrated program of action, which might include:

- Construction of networks of support for youth climate activism within multiple social sectors;
- Construction of global electronic and in-person networks of diverse youth activists;
- Development of accessible educational programs for youth emphasizing social and environmental justice, consciousness raising, and the dynamics of advocacy, civil resistance, and movement building—including through narratives (adapted from Mattaini, 2015).

A first step in such an analysis in the forestation example will require gathering information about the current situation (for example, the types, size, and status of forests or trees within your target area: whether that is a neighborhood, the Amazon forests of Brazil, or something in between), as well as a history of how the current situation developed. Librarians, publications, activists or rangers working in the field, and government offices might be among valuable sources (and often will cooperate). A second step would include research and work with local persons or groups to collaborate on deciding on beginning sustainment or improvement goals, including:

- the variables to be changed to meet overall goals;
- the decision makers who would be in positions to implement changes consistent with the established goals;
- those in positions to influence those decision makers—"influencers" in today's argot.

Key players in your analysis might include many of those you have had contact with in making your plans, but also those in positions of power that you identify, including legislators, activist organizations, corporations, forestry officials, loggers, hunters, students, religious communities, and many others in position to support or

Table 3 Sample practices in a matrix of key community sectors that support or oppose youth activism

Sector	Practices supporting activism	Practices opposing activism	Incentives, disincentives, and facilitating conditions
Schools	Staff act as mentors, models, and allies in youth activism inside and outside the school; youth voice respected; issues of sustainability and nonviolent action integrated into curriculum	Suppress youth voice related to curriculum, policies, sustainability issues and active solutions	Encouragement from school administration and parents; partnerships with activist organizations
Social Media Influencers	Share stories of youth as courageous contributors to community, offer alternative narratives emphasizing social justice	Encourage portrayal of youth in dangerous, incompetent of violent roles; emphasize models of self-indulgent overconsumption and disrespect of others	Broad user and media attention, community encouragement, internal policy guidance
Churches	Offer youth opportunities to explore moral and spiritual implications of social and environmental issues; provide opportunities to partner with adult activists and allies	Focus exclusively on interior spiritual life without significant attention to social injustices or climate action	Guidance of church hierarchies and elders; response of church members to youth activism
Nongovernmental organizations (NGOs)	Facilitate connections among youth-led organizing efforts locally and globally; offer training in strategic options including nonviolent resistance and peacemaking in strategic collaborations	Establish youth programs that treat youth primarily as service recipients, problems to be contained, or clients to be treated	Available funding and staffing; examples of other sustainability-focused NGOs; available partnerships with activist organizations
Arts community	Actively reach out to youth and serve as mentors and allies in arts projects directly or indirectly related to social justice and human rights issues (including murals, photovoice, music, theatre, dance)	Maintain distance from youth; regard youth as "difficult to work with" or unprepared to make genuine artistic contributions	Availability of funding; inspirational artist models; support from arts venues (galleries, theatres, local business communities) and local government

block the changes you would like to see. Useful influencers might include professionals, academics, business leaders, the "person on the street," a college action group, and many others. It would also be useful in this process to identify and chart resources available and needed (knowledge, financial, equipment, and human), and connections among actors and organizations—always with attention to both relevant contingencies (existing or potential) and relevant relational framing. For each key group of actors included in your analysis, you would want to identify current and possible reinforcers and aversives that might be relevant, along with current and desired motivating operations (with particular attention to current relational responding), and who might be in a position to shift those contingencies and motivating operations, as well as developing and testing potential shared narratives with and for the group.

By constructing a matrix integrating behavior and contingencies potentially valuable for potentially shifting the actions of critical players, your project can identify realistic next steps. For example, narrative projects might be implemented to engage some groups (including students, teachers, and activist groups) to emphasize the critical value of trees/forests/natural ecosystems (to give us and our children and grandchildren, the oxygen we need; opportunities for recreation, etc.), and stories about how the current crises have been or could be resolved by persons similar to the audiences targeted. There may be many opportunities for those with artistic talents or interests to participate in "telling this story" via a range of media, selected based on audiences, and in some cases perhaps enacted by members of the target audiences. Narrative and artistic efforts alone might produce meaningful changes. They can not only create new relational responses, but can also surface and encourage potentially critical contingency networks like social reinforcement for sustainable actions among social groups or community efforts as discussed by Bonner and Biglan (2021). If these steps, helpful as they can be, do not result in adequate outcomes, more extensive nonviolent social action may be required. Such action (and in fact any of these options) will require outreach to other groups and disciplines to share knowledge, resources … and power.

In Conclusion

It is difficult to imagine a more challenging and more fascinating project than scientifically engaging cultural systems analysis supported by meaningful narratives to contribute to GCJ. Yes, the struggles involved in climate change and associated political conflicts are enormous, uncertain, and will be painful. Despite decades of work, none of the existing models for mitigating or adapting to climate change offers a realistic route to stable end-state solutions even for the wealthiest nations, much less the world (Brooks, 2020). Ethical and moral obligations for us each individually, and for our science collectively, are sobering. Nonetheless, this is the position in which we find ourselves. From a behavioral perspective, our best available tools at present appear to be a combination of narratives challenging accepted realities, and cultural level systems analyses. Narrative is valuable because shared stories can contribute to new and shared understandings and values. Stories that can shape and

support alternative networks of reinforcers are essential, drawing on Goldiamond's emphasis on constructional as opposed to aversive methods. Further, global climate challenges operate in systemic ways, and need to be understood and rebuilt in complex and integrated ways. Scientific systemic modeling can begin to unwrap those complexities (e.g., Kwakkel & Pruyt, 2015; Mobus, 2022; Wolfram, 2002, p. 363). Learning to effectively model systems like forests, or intergovernmental planning processes locally and globally, will be required to meet our goals as a discipline, and can have the potential to be personally reinforcing.

References

Abrahamse, W., Steg, L., Vlec, C., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology, 25*, 273–291. https://doi.org/10.1016/j.jenvp.2005.08.002

African Sisters Educational Collaborative (2019). Sisters at the forefront of sustainable agriculture in Africa. http://www.asec-sldi.org/news/success/sustainable-agriculture-africa/. Accessed 28 Dec 2022

Alavosius, M. P., & Houmanfar, R. A. (2020). Global warming: Analysis of behavior and organizational practices as climate impacts increase. In T. M. Cihon & M. A. Mattaini (Eds.), *Behavior science perspectives on culture and community* (pp. 221–256). Springer. https://doi.org/10.1007/978-3-030-45421-0_10

Ardila Sánchez, J. G., Cihon, T. M., Malott, M. E., Mattaini, M. A., Rakos, R. F., Rehfeldt, R. A., Richling, S. M., Roose, K. M., Seniuk, H. A., & Watson-Thompson, J. (2020). Collective editorial: Ten guidelines for strategic social action. *Behavior and Social Issues, 29*, 15–30. https://doi.org/10.1007/s42822-020-00038-8

Aspholm, R. R., & Mattaini, M. A. (2017). Youth activism as violence prevention. In P. Sturmey (Ed.), *The Wiley handbook of violence and aggression* (pp. 1–12). Wiley. https://doi.org/10.1002/9781119057574.whbva104

Baron, J., & Hoeksema, M. J. (2021). Science advocacy 101: Realizing the benefits, overcoming the challenges. *Behavior and Social Issues, 30*, 121–138. https://doi.org/10.1007/s42822-021-00069-9

Bezner Kerr, R., T. Hasegawa, R. Lasco, I. Bhatt, D. Deryng, A. Farrell, H. Gurney-Smith, H. Ju, S. Lluch-Cota, F. Meza, G. Nelson, H. Neufeldt, and P. Thornton. (2022). Food, fibre, and other ecosystem products. In: climate change 2022: Impacts, adaptation, and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. https://www.ipcc.ch/report/ar6/wg2/about/how-to-cite-this-report/. Accessed 28 Dec 2022

Beresford-Kroeger, D. (2021). *To speak for the trees*. Timber Press.

Biglan, A. (1995). *Changing cultural practices*. Context Press.

Biglan, A. (2015). *The nurture effect: How the science of human behavior can improve our lives and our world*. New Harbinger Publications.

Bonner, A. C., & Biglan, A. (2021). Rebooting behavioral science to reduce greenhouse gas emissions. *Behavior and Social Issues, 30*, 106–120. https://doi.org/10.1007/s42822-021-00058-y

Bonner, A. C., & DeLeon, I. G. (2021). *Evaluating the predictive utility of the environmental awareness and responsibility treatment hierarchy*[unpublished manuscript]. Department of Psychology, University of Florida, Gainesville, United States of America.

Bordoff, J., & O'Sullivan, M. L. (2022). Green upheaval: The new geopolitics of energy. *The Atlantic.* https://www.foreignaffairs.com/articles/world/2021-11-30/geopolitics-energy-green-upheaval. Accessed 28 Dec 2022

Brooks, T. (2020). Climate change ethics and the problem of end-state solutions. In T. Brooks (Ed.), *The Oxford handbook of global justice* (pp. 241–258). Oxford.

Chenoweth, E., & Stephan, M. J. (2011). *Why civil resistance works: The strategic logic of nonviolent conflict*.

Chrzanowska, N. (2022). Inside Patagonia's efforts to tackle a full-scale energy crisis. https://www.netguru.com/blog/patagonia-solution-climate-crisis. Accessed 28 Dec 2022

Critchfield, T. (2018). An emotional appeal for the development of empirical research on narrative. *Perspectives on Behavior Science, 41*, 575–590. https://doi.org/10.1007/s40614-018-0170-9

Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences of the United States of America, 111*(Supplement 4), 13614–13620. https://doi.org/10.1073/pnas.1320645111

DeMarco, R., & Tufts, K. A. (2014). The mechanics of writing a policy brief. *Nursing Outlook, 62*(3), 219–224. https://doi.org/10.1016/j.outlook.2014.04.002

Deming, B. (1971). *Revolution and Equilibrium. Grossman., ISBN-13*, 978–0670596508.

Devlin-Foltz, D., Fagen, M. C., Reed, E., Medina, R., & Neiger, B. L. (2012). Advocacy evaluation: Challenges and emerging trends. *Health Promotion Practice, 13*(5), 581–586 https://journals.sagepub.com/doi/10.1177/1524839912446482

Dixon, M. R., Dymond, S., Rehfeldt, R. A., Roche, B., & Zlomke, K. R. (2003). Terrorism and relational frame theory. *Behavior and Social Issues, 12*(2), 129–147. https://doi.org/10.5210/bsi.v12i2.40

Dixon, M. R., Belisle, J., Rehfeldt, R. A., & Root, W. B. (2018). Why we are still not acting to save the world: The upward challenge of a post-Skinnerian behavior science. *Perspectives on Behavior Science, 41*(1), 241–267. https://doi.org/10.1007/s40614-018-0162-9

Fawcett, S. B. (1991). Some values guiding community research and action. *Journal of Applied Behavior Analysis, 24*(4), 621–636. https://doi.org/10.1901/jaba.1991.24-621

Fawcett, S. B., Bernstein, G. S., Czyzewski, M. J., Greene, B. F., Hannah, G. T., Iwata, B. A., Jason, L. A., Mathews, R. M., Morris, E. K., Otis-Wilborn, A., Seekins, T., & Winett, R. A. (1988). Behavior analysis and public policy. *The Behavior Analyst, 11*(1), 11–25. https://doi.org/10.1007/BF03392450

Freer-Smith, P. H., Broadmeadow, M. S., & Lynch, J. M. (2007). *Forestry and climate change*. CAB. *International.*, *ISBN-13*, 978-1-84593-294-7.

Gandhi, M. K. (1945). *Constructive program: Its meaning and place*. India: Navajivan Publishing Ahmedabad.

Gelino, B. W., Erath, T. G., Seniuk, H. A., Luke, M. M., Berry, M. S., Fuqua, R. W., & Reed, D. D. (2020). Global sustainability: A behavior analytic approach. In T. C. Cihon & M. A. Mattaini (Eds.), *Behavior science perspectives on culture and community* (pp. 257–281). Springer. https://doi.org/10.1007/978-3-030-45421-0_11

Gelino, B. W., Erath, T. G., & Reed, D. D. (2021). Going green: A systematic review of proenvironmental empirical research in behavior analysis. *Behavior and Social Issues, 30*, 587–611. https://doi.org/10.1007/s42822-020-00043-x

Grant, L. K. (2005). The secrets of Scheherazade: Toward a functional analysis of imaginative literature. *The Analysis of Verbal Behavior, 21*, 181–190. https://doi.org/10.1007/BF03393020

Grant, L. K. (2007). The veils of Clio: Dimensions of a behavioral narratology. *The Analysis of Verbal Behavior, 23*, 57–69. https://doi.org/10.1007/BF03393047

Grant, L. K. (2011). In response: Can we consume our way out of climate change? A call for analysis. *The*. *Behavior Analyst, 34*, 245–266. https://doi.org/10.1007/BF03392256

Grant, L. K. (2012). Does abstracting threaten a sustainable future? *The Psychological Record, 62*, 337–350. https://doi.org/10.1007/BF03395806

Grant, L. K., & Forrest, M. (2020). Can stories influence sustainable behavior. In T. M. Cihon & M. A. Mattaini (Eds), *Behavior Science Perspectives on Culture and Community* (pp 283–306). https://doi.org/10.1007/978-3-030-45421-0_12.

Hassoun, N. (2020). Aiding the poor in present and future generations: Some reflections on a simple model. In T. Brooks (Ed.), *The Oxford handbook of global justice* (pp. 214–238). Oxford.

Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2002). *Relational frame theory: A post-Skinnerian account of human language and cognition.* Kluwer Academic Publishers.

Hausfather, Z. (2022). New York Times: Let's not pretend planting trees is a permanent climate solution.

Hedges, C., & Sacco, J. (2014). Days of destruction, days of revolt. *Hachette UK., ISBN-13*, 978–1568588247.

Hineline, P. N. (2018). Narrative: Why it's important, and how it works. *Perspectives on Behavior Science, 41*(2), 471–502. https://doi.org/10.1007/s40614-018-0137-x

IPCC. (2007). Summary for policymakers. In M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, & C. E. Hanson (Eds.), *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. https://www.eea.europa.eu/data-and-maps/indicators/soil-organic-carbon-1/IRationaleReference1232455014617. Accessed 18 Aug 2019.

Jensen, D., Keith, L., & Wilbert, M. (2020). *Bright green lies.* Monkish Book Publishing.
Kazdin, A. E. (2020). *Single-case research designs: Methods for clinical and applied settings*. Oxford University Press.
Koh, L. P., Zeng, Y., Sarira, T. V., & Siman, K. (2021). Carbon prospecting in tropical forests for climate change mitigation. *Nature Communications, 12*(1271), 1–9. https://doi.org/10.1038/s41467-021-21560-2
Koger, S. M., & Winter, D. D. (2010). *The psychology of environmental problems* (3rd. ed.).. Taylor and Francis.
Korten, D. C. (2015). *Change the story, change the future: A living economy for a living earth*. Berrett-Koehler.
Kwakkel, J. H., & Pruyt, E. (2015). Using system dynamics for grand challenges: The ESDMA approach. *Systems Research and Behavioral Science, 32*(3), 358–375. https://doi.org/10.1002/sres.2225
Kruglanski, A. W., Bélanger, J. J., Chen, X., Köpetz, C., Pierro, A., & Mannetti, L. (2012). The energetics of motivated cognition: A force-field analysis. *Psychological Review, 119*(1), 1. https://doi.org/10.1037/a0025488
LaDuke, W. (1999). *All my relations*. South End Press.
Layng, T. V. J, (2022). Appendix A: The search for an effective clinical behavior analysis: The nonlinear thinking of Israel Goldiamond (pp. 58–78). In Israel Goldiamond, *a programing contingency analysis of mental health.* Association for Behavior Analysis International.
Lee, C. M. (2016). Speaking up for science. *Trends in Immunnology, 37*(4), 265–268. https://doi.org/10.1016/j.it.2016.02.003
Lewin, K. (1964). Field theory in social science. *Harper & Row, ISBN-13*, 978–0226476506.
Lin, H., & Epstein, L. H. (2014). Living in the moment: Effects of time perspective and emotional valence of episodic thinking on delay discounting. *Behavioral Neuroscience, 128*(1), 12. https://doi.org/10.1037/a0035705
Mattaini, M. A. (2013). *Strategic nonviolent power:The science of Satyagraha.* Athabasca University Press. https://www.aupress.ca/app/uploads/120224_99Z_Mattaini_2013-Strategic_Nonviolent_Power.pdf. Accessed 28 Dec 2022
Mattaini, M. A. (2015). Toward a twenty-first century, science-based "constructive programme." In Amster, R., Finley, L., Pries, E., & McCutchen, R. (Eds.), *Peace studies between tradition and innovation.* ISBN: 978-1-4438-7166-2.
Mattaini, M. A. (2021). Perspectives on conceptual underpinnings for culturo-behavior science. Presentation at 2021 Association for Behavior Analysis International convention. Available from author.
Mattaini, M., & Holtschneider, C. (2017). Collective leadership and circles: Not invented here. *Journal of Organizational Behavior Management, 37*(2), 126–141. https://doi.org/10.1080/01608061.2017.1309334
Mattaini, M. A., Esquierdo-Leal, J. L., Ardila Sánchez, J. G., Richling, S. M., & Ethridge, A. N. (2020). Public policy advocacy in culturo-behavior science. In T. M. Cihon & M. A. Mattaini (Eds.), *Behavior science perspectives on culture and community* (pp. 385–412). Springer. https://doi.org/10.1007/978-3-030-45421-0_16
Mattaini, M. A., & Rehfeldt, R. A. (2020). Rendezvous with truth and discovery. *Behavior and Social Issues, 29*, 1–14. https://doi.org/10.1007/s42822-020-00034-y
Mattaini, M. A., & Roose, K. M. (2021). Emerging culturo-behavior science contributions to global justice. *Behavior and Social Issues, 30*, 215–236. https://doi.org/10.1007/s42822-021-00073-z
Mayell, H. (2002). *Climate studies point to more floods in this century*. National Geographic News. January, 30th.
McCarthy, R. M., & Sharp, G. (1997). *Nonviolent action: A research guide*. Garland.
Meyer, R. (2022). We have two impossible paths to avoid the worst of climate change. *The Atlantic* para. 4. https://www.theatlantic.com/science/archive/2022/04/ipcc-report-climate-change-2050/629691/. Accessed 28 Dec 2022
Mobus, G. E. (2022). Systems science: Theory, analysis, modeling, and design. *Springer*. https://doi.org/10.1007/978-3-030-2022
Nanson, A. (2021). *Storytelling and ecology: Empathy, enchantment and emergence in the use of oral narratives*. Bloomsbury Publishing.
Nevin, J. A. (2005). The inertia of affluence. *Behavior and Social Issues, 14*, 7–20. https://doi.org/10.5210/bsi.v14i1.118
Noel, D. (n.d.) What is matrix thinking. *Ben Franklin Centre for Theoretical research* (Australia). http://aoi.com.au/MTSite/MT101.htm

NRDC (2021). Global climate change: What you need to know. https://www.nrdc.org/stories/global-climate-change-what-you-need-know. Accessed 28 Dec 2022

Platt, C. (2021). *The Afro-minimalist's guide to living with less*. Simon and Schuster.

Reed, D. D., Strickland, J. C., Gelino, B. W., Hursh, S. R., Jarmolowicz, D. P., Kaplan, B. A., & Amlung, M. (2022). Applied behavioral economics and public health policies: Historical precedence and translational promise. *Behavioural Processes, 198*, 104640. https://doi.org/10.1016/j.beproc.2022.104640

Rehfeldt, R. A., & Tyndall, I. (2022). Why we are not acting to save ourselves: ACT, health, and culture. *Behavior Analysis in Practice, 15*, 55–70. https://doi.org/10.1007/s40617-021-00592-6

Reynolds, D. S. (2011). *Mightier than the sword: Uncle Tom's cabin and the battle for America*. W.W: Norton.

Roose, K. M., & Mattaini, M. A. (2020). Challenging violence: Toward a twenty-first century, science-based "Constructive Programme." In *Behavior science perspectives on culture and community* (pp. 307–331). Springer. https://doi.org/10.1007/978-3-030-45421-0

Rose, S. D. (1977). Group therapy: A behavioral approach. *Prentice-Hall., ISBN-13*, 978–0133652390.

Rose, S. D. (1998). Group therapy with troubled youth: A cognitive-behavioral interactive approach. *Sage Publications, Inc., ISBN-13*, 978–0761909279.

Rudel, T. K., Meyfroidt, P., Chazdon, R., Bongers, F., Sloan, S., Grau, H. R., Van Holt, T., & Schneider, L. (2020). Whither the forest transition? Climate change, policy responses, and redistributed forests in the twenty-first century. *Ambio, 49*, 74–84. https://doi.org/10.1007/s13280-018-01143-0

Schell, J. (2003). *The unconquerable world: Nonviolence and the will of the people*. Metropolitan Books.

Schlosberg, D. (2004). Reconceiving environmental justice: Global movements and political theories. *Environmental Politics, 13*(3), 517–540. https://doi.org/10.1080/0964401042000229025

Schlosberg, D. (2007). Defining environmental justice: Theories, movements and nature. *Oxford University Press*. https://doi.org/10.1093/acprof:oso/9780199286294.001.0001

Schlosberg, D. (2014). Ecological justice for the anthropocene. In M. Wissenburg & D. Schlosbery (Eds.), *Political animals and animal politics* (pp. 75–89). Palgrave Macmillan.

Seniuk, H. A., Cihon, T. M., Benson, M., & Luke, M. M. (2019). Making a footprint in environmental sustainability: A behavioral systems approach to engaging the behavioral community. *Perspectives on Behavior Science, 42*, 911–926. https://doi.org/10.1007/s40614-019-00233-y

Sharp, G. (2005). *Waging nonviolent struggle: 20th century practice and 21st century potential.* Extending Horizons Books.

Sharp, G., & Raqib, J. (2010). *Self-liberation: A guide to strategic planning for action to end a dictatorship or other oppression*. Albert Einstein Institution.

Shevorykin, A., Bickel, W. K., Carl, E., & Sheffer, C. E. (2021). Future thinking priming especially effective at modifying delay discounting rates among cigarette smokers. *International Journal of Environmental Research and Public Health, 18*(16), 8717. https://doi.org/10.3390/ijerph18168717

Shiber-Knowles, D. (2019). Our journey to 100% renewable power: A story of soap, bees, teachers, farmers, and community. https://www.drbronner.com/all-one-blog/2019/11/journey-100-renewable-power/. Accessed 28 Dec 2022

Shue, H. (2020). Distant strangers and the illusion of separation: Climate, development, and disaster. In T. Brooks (Ed.), *The Oxford handbook of global justice* (pp. 259–276). Oxford.

Sidman, M. (2009). Equivalence relations and behavior: An introductory tutorial. *The Analysis of Verbal Behavior*, *25*(1), 5–17. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2779070/. Accessed 28 Dec 2022

Smil, V. (2022). How the world really works: The science behind how we got here and where We're going. *Viking., ISBN-13*, 978–0593297063.

Spier, M. S. (1973). Force field analysis. In J. E. Jones & J. William Pfeiffer, (Eds.) *The 1973 Annual handbook for group facilitators* (pp. 111–113). San Diego, CA: University Associates.

Stein, J. S., Wilson, A. G., Koffarnus, M. N., Daniel, T. O., Epstein, L. H., & Bickel, W. K. (2016). Unstuck in time: Episodic future thinking reduces delay discounting and cigarette smoking. *Psychopharmacology, 233*, 3771–3778. https://doi.org/10.1007/s00213-016-4410-y

Steingraber, S. (2015). How we banned fracking in New York. https://www.commondreams.org/views/2015/01/23/how-we-banned-fracking-new-yorkIPCC. Accessed 28 Dec 2022

Stowe, H. B. (1852/1995). *Uncle Tom's cabin; or life among the lowly.* Retrieved from https://www.gutenberg.org/files/203/203-h/203-h.htm. Accessed 28 Dec 2022

News, U. N. (2022). *IPCC adaptation report "a damning indictment of failed global leadership on climate*. UN News.

van der Zee, R. (2015). How Amsterdam became the bicycle capital of the world. https://www.theguardian.com/cities/2015/may/05/amsterdam-bicycle-capital-world-transport-cycling-kindermoord. Accessed 28 Dec 2022

Watson-Thompson, J., Fawcett, S. B., & Schultz, J. A. (2008). A framework for community mobilization to promote healthy youth development. *American Journal of Preventive Medicine, 34*(3), S72–S81. https://doi.org/10.1016/j.amepre.2007.12.016

Watson-Thompson, J., Rakos, R. F., & Anderson-Carpenter, K. (2021). An editorial on revitalizing behavioral community psychology: Where do we go from here? *Behavior and Social Issues, 30*, 514–524. https://doi.org/10.1007/s42822-021-00080-0

Watson-Thompson, J., Jessop, N., Hassaballa, I., Vanchy, P., Henderson, J., & Moore, C. (2020). Together helping reduce youth violence for equity (ThrYve): Examining the development of a comprehensive multisectoral approach to youth violence prevention. *American Journal of Community Psychology, 66*(3–4), 244–255. https://doi.org/10.1002/ajcp.12449

Williams, O. (2018). Cycling changed my life and I never want to own a car again. https://medium.com/@ow/its-time-to-consider-cars-a-luxury-cycling-is-taking-the-world-by-storm-137afbd0775f. Accessed 28 Dec 2022

Wolfram, S. (2002). *A new kind of science*. Wolfram Media Inc.

Wong, S. L., Green, L. A., & Bazemore, A. W. (2017). How to write a health policy brief. *Families, Systems & Health, 35*(1), 21–24. https://doi.org/10.1037/fsh0000238