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Towards an incoherent convergence science: diverse economies, crises, and recoveries, and the hope for better futures

Manuel R. Montoya [1], *Renia Ehrenfeucht* [2], *Marygold Walsh-Dilley* [3], *Benjamin P. Warner* [3] and *Cassidy A. Tawse-Garcia* [3]

ABSTRACT. Here, we argue for a critical approach to convergence science: one that develops collaborative problem-solving for pressing contemporary crises. We ask for researchers to encounter spaces where diverse epistemological and ontological perspectives can build solutions based on on-the-ground practices and existing knowledge. This approach contrasts with status quo crisis responses, which are imbricated with dominant forms of capitalism, and whose solutions reinforce the very systems that caused these crises. An incoherent convergence, in contrast, requires university researchers to come together with other knowledge bearers to lay bare the incongruities among systems while also encouraging ontological and epistemological pluriversality without assuming a singular understanding, a singular path forward, or a shared worldview. We draw on the situation in Mora, New Mexico, USA, and its recovery from the Hermits Peak Calf Canyon wildfire of 2022 to illustrate the disjuncture that arose between the community and the dominant disaster response regime. We argue that convergence science has the potential to address such failures, but only by embracing rather than rationalizing the messiness of on-the-ground realities. Without a new approach, applied research may continue to reproduce the structural inequalities among these diverse communities, including the political-economic processes wrought from climate change. Convergence science, we argue, needs spaces of engagement with that which remains illegible within the privileged scientific paradigm.

Key Words: *convergence science; disaster capitalism; disaster recovery; diverse economies; incoherence; Mora, New Mexico, USA; pluriverse*

INTRODUCTION: INCOHERENCE IN CONVERGENCE SCIENCE

Here, we introduce a critical approach as part of the effort to generate convergence science across academia, an effort that has arisen in an era defined by intersecting crises. We highlight how the climate crisis, alongside persistent coloniality, shaped the outcomes of a destructive event: the Hermits Peak Calf Canyon (HPCC) wildfire complex, the largest fire in New Mexico's history, and a disaster for local communities. The challenge for researchers is that scientific knowledge production within academia operates within the same institutional and ideological systems that generated the conditions of crisis. It thereby helps to produce the societal outcomes and processes it purportedly observes or explains. We draw on foundational social sciences and humanities concepts to argue for an incoherent convergence science. We seek to create the metacognitive scaffolding (Boon and Van Baalen 2019) for researchers in Western scientific traditions to learn from and collaborate with diverse epistemologies and ontologies.

Peek (2022) defines convergence science as "an approach to knowledge production and action that involves diverse teams working together in novel ways - transcending disciplinary and organizational boundaries - to address vexing social economic, environmental, and technical challenges in an effort to reduce disaster losses and promote collective well-being." Calls for convergence science emphasize that today's biggest problems require integration of knowledge and methods from across disciplines, and potentially, from outside traditional scholarship (Apgar et al. 2009). We introduce "incoherence" as a concept to ease the tendency of Western science to operate unidirectionally, particularly as researchers deploy knowledge or respond to situations in ways that appear rational to the researchers but not to other stakeholders and rights holders. An "incoherent" approach recognizes the range of knowledge holders and knowledge builders needed to create innovative solutions for areas of societal interest. Simultaneously, it embraces a pluriversal notion of design, recognizing "diverse forms of life and, often, contrasting notions of sociability and the world" (Escobar 2018:3). This approach neither privileges generalizable knowledge nor fills knowledge gaps with assumptions of consistent or coherent outcomes. Instead, incoherent convergence values grounded and situated knowledge and expertise that reflect the diverse forms of life and sociability within the world. While new knowledge can and will be useful for multiple situations, and it will build knowledge at different scales, the focus is on specific knowledge building and problem-solving, recognizing a plurality of convergences that can but do not necessarily cohere.

Early convergence science was grounded in physical and engineering sciences (Sharp and Leshner 2014). More recently, convergence science teams have sought to integrate diverse fields of knowledge from the social sciences, humanities, and outside academia (Morgan et al. 2025). However, convergence science often struggles to integrate diverse disciplines and approaches (Overland and Sovacool 2020), and recent debates in convergence science emphasize that "this sort of collaborative inquiry is easier suggested than undertaken" (Apgar et al. 2020:4). This difficulty is in part because knowledge claims and scientific approaches carry with them distinct epistemic and ontological values that are not readily reconcilable (MacMynowski 2007, Morgan et al. 2025). Scientific models from engineering and the physical sciences are often privileged for recovery and restoration after extreme events, both making them visible and giving them authority, presumed validity, and therefore, influence (MacMynowski 2007). Other fields, including social sciences and humanities, are excluded or unevenly or poorly integrated (Overland and Sovacool 2020), as are the multiple forms of knowledge and worldviews within specific places and communities.

[1]University of New Mexico, [2]Community and Regional Planning Department, University of New Mexico, [3]Department of Geography and Environmental Studies, University of New Mexico

Best practices and theory in convergence science emphasize the need for dialogue across different approaches and bodies of knowledge to develop a metacognitive scaffolding to facilitate successful convergence (Boon and Van Baalan 2019, Apgar et al. 2020). Despite best efforts, convergence research often reproduces the scientific status quo, relying on dominant frameworks to articulate goals and findings (MacMynowski 2007, Lövbrand et al. 2015, Morgan et al. 2025). We suggest that convergence-through-representation of diverse academic disciplines and non-academic knowledge is insufficient. Convergence science needs spaces where researchers can engage with that which is illegible within the dominant scientific paradigm.

An incoherent convergence science approach may require moving at a deliberately slow pace to build the necessary collaborative spaces of reflection, encounter, and engagement. We acknowledge that a slower pace may be difficult, given the incentives and training that most of us receive in academia. However, creating spaces of encounter across diverse knowledge and ways of knowing cannot be sped past; it is, in many ways, the work that needs to be done. "A science that is able to doubt itself can explore the possible and address crises to come," Stengers (2016:53) tells us. "But," she continues, "doubt is slow." Slowing is needed both to evaluate the methods currently in use and to explore what additional forms of knowledge production are present, if perhaps not readily visible. Some forms of knowledge production may not appear rational or even relevant, but their value for generating innovation can be seen with a slower approach. Academic research can oversimplify the complexities of social life, often overconfident with a desire to imprint itself on others as the privileged form of knowledge production. An incoherent convergence approach requires humility and care.

Here, we argue that disaster response reflects governance and scientific approaches that reproduce dominant ideas and too often exclude local, diverse economic forms that hold both cultural meaning and economic value to the local people and communities. What is needed, instead, is an incoherent convergence science that both makes visible and recognizes local diversity and the grounded knowledge on which they rely. Incoherence is an appeal to cultivate a recognition of the ambiguity necessary to elevate knowledge and lifeways that are illegible to the scientific community.

Part of what we encountered as we initiated conversations with wildfire victims of the HPCC was the degree to which emergency response managers expected the survivors either to tacitly understand the expected outcomes of the crisis mitigation efforts or to understand the bureaucratic and financial expectations within the compensation framework that followed. To receive support, residents had to adopt the state's way of thinking. Incoherence, in contrast, argues for a specific kind of equity based on the epistemological and ontological differences and imbalances witnessed by the team as we engaged with the community post-wildfire.

We next discuss three societal processes that shape how Mora fared after the HPCC. First, we historicize science and the dominant economy by placing them within the context of modernity, a key concept from critical social theory that helps to reveal the structures of contemporary society. We then turn to ways that disasters create the conditions for further extraction rather than regenerating or strengthening diverse systems. We argue that the conditions of modernity led to a recovery regime that disrupts diverse economies and enacts violence in Mora and elsewhere. Finally, we recognize how diverse economies continue to operate in a dominant capitalist world system. Subsequently (in *Incoherence in Crisis, Mora, New Mexico, USA*), we explore how the dominant knowledge system shaped the disaster response and its outcomes in Mora. Finally (in *Towards an Incoherent Convergence*), we outline the implication of this specific case for convergence more generally, arguing for integration of incoherence into the convergence science framework.

FROM SEEKING COHERENCE TO AN INCOHERENT CONVERGENCE

To argue for an incoherent convergence science, we focus on diverse economies during a multiscalar crisis moment after the HPCC fire in Mora, New Mexico, USA. In 2022, the largest wildfire in New Mexico's history burned nearly 141,000 ha, with fire suppression costs estimated at USD $132 million (New Mexico Forest and Watershed Restoration Institute 2022), and > 900 structures burned. The fire complex resulted from two fires joining, both of which began from intentional burns conducted by the U.S. Forest Service, exacerbating the residents' mistrust of government. As of April 2024, two years after the fire started, one-third of claimants to the Federal Emergency Management Agency, the U.S. government agency in charge of emergency response and recovery, were still waiting for their recovery assistance (Peck 2024). The fire required an immediate response, and the recovery period that followed activated a series of conditions that revealed the economic incongruities between disaster relief-and-recovery and Mora's diverse economic landscape.

Mora, a community of 800 residents, is many things. It is a community connected by mission churches established by Spanish Colonial Catholicism, a land grant to a Hispanic farming community soon after Mexico gained independence from Spain in 1821, and a river valley that separated Pueblo communities from Ute, Apache, Navajo, and Comanche migration in the pre-colonial era. As an economic hub between immigrant merchants and the U.S. Army located in Fort Union in the 1850s, Mora has become a county in New Mexico with a population of 4169 residents established with New Mexico's territorial legislature in 1860, within the state of New Mexico with its layered with colonial systems, first by the Spanish that pushed up from New Spain and later by the U.S. government. Hispano farmers and Puebloan peoples built the village of Mora, and Mora's traditions and worldviews are grounded in a particular confluence in which its residents creatively adapted to outside forces and local conditions.

Prior to the fire, Mora was undergoing contemporary transitions facing many U.S. small towns and rural areas. It lost population as global economic production concentrated in global cities and other strategic sites (Sassen 2019) and national population growth slowed (Mallach 2023). Between 2010 and 2021, Mora's population declined by 14% and grew older as younger residents moved for school and work (https://data.census.gov/profile/Mora_County,_New_Mexico?g=050XX00US35033). At the same time, in a community that was established around the early Spanish institutions that governed collective holdings of land and water, the original acequia water system remains and continues

to be protected by the Treaty of Guadalupe Hidalgo and the state's acceptance of traditional land-use practices as a legitimate form of governance (U.S. National Archives 1848). The HPCC fires of 2022 brought new challenges for the residents of Mora, mostly centered around the human systems influenced by its place and history, systems largely illegible to the bureaucratic eye of the disaster recovery apparatus.

The disaster recovery apparatus, built from the National Federal Emergency Management Agency, is an important mechanism for supplying resources following such extreme and destructive events. However, it is not designed to support the diverse economies found in Mora and elsewhere. We define diverse economies as the myriad ways through which people meet needs and allocate resources. They are systems through which people forge their livelihoods, both "making a living [and] making living meaningful" (Bebbington 1999). In each community, different economies coexist alongside and operate simultaneously with the dominant market economy. We conceptualize these diverse economies as cultural, social, and political, and we consider them a pluriverse of intersecting, layered societal systems imbued with history, values, and priorities (Escobar 2018). Mora's economies developed over centuries. Colonization, racialization, industrial capitalism, neoliberalism, and globalization shaped the social and political worlds people navigated, adapted to, and resisted as they built their lives. However, the disaster recovery apparatus fails to acknowledge or value many diverse economic forms, despite their importance in the livelihoods of local people, and their immediate role as an initial, local response to crisis.

Crises are revelatory moments when the complicated is seemingly simplified or when something elusive or obscure becomes more apparent. Within this context, the term crisis has been used to describe both the general conditions of climate change, and localized, violent, and visible change in circumstances that break apart the foundations of a given society or community. Crises, therefore, become important moments to illuminate processes and relationships, particularly the disjuncture at hand in the case of Mora and the HPCC.

Modernist ideology underlies contemporary crises

A core observation is that modernity's fundamental assumptions led to the current crises and explain the disjunctures between Mora's lifeways and the disaster recovery apparatus. Modernity describes both an organizing idea and the era when a fundamental shift in social and social-ecological relationships generated contemporary political economic forms. Tönnies (1957) described modernity as a transition from a community bound by collective norms and mutualism to a society bound together through individual self-interest. Adam Smith was excited by the new political economy that he thought could lead to the wealth of nations, while others, notably Karl Marx, argued that the emergent economic forms of capitalism functioned fundamentally through exploitation of the working class. They agreed that a new age, a modern era, had emerged, defined by capitalism as the primary economic form and the nation-state as the primary mediator of political affairs.

Other powerful ideologies emerged at this time, including: science as the privileged form of knowledge production; the growth of and belief in technology, modern medicine, and industry; the Cartesian notions of the separation of human and nature and the human duty to control nature for human use; and progress and growth as arbiters of human ingenuity (see Hamilton 1992, Hall et al. 1996). The emerging scientific disciplines supported industrialization and its technologies along with extraction, domination, and a human-centric view of natural resources that supported these developments.

Society became organized around an instrumental rationality particularly well-adapted to modern capitalism. Weber (1978) proposed that this rationality was guided by calculability, the ability to quantify outcomes and actions, and predictability, concepts that underly many scientific methods. Money became the arbiter of value. Property, indeed, all wants or needs, became privatized and individualized, and self-interest was increasingly maximized through a means-end calculation. Weber recognized other forms of rationality beyond the instrumental—people are also motivated by culture, tradition, and emotions, among other things—but modern institutions elevate calculable, instrumental rationality and reward those who shape their behavior around it. Foucault (1995) suggested that modernity also required new forms of subjectivity: people within such systems must be disciplined to accept and undertake these practices of modernity. Everyday institutions, including education, medicine, health care, government, and corporate bureaucracies, work together to discipline the social body so that people can participate in the modern economy as both capable and compliant subjects.

These ideologies enabled the forms of violence and exploitation that generated the contemporary crises. Instrumental rationality created societal structures that treated complex natural worlds as resources for extraction and led to environmental degradation, including the climate crisis (Ghosh 2021). Calculability and instrumentality both aided and were reinforced by colonization; for instance, the emergent discipline of accounting was central to and developed through the management of plantation slavery (Rosenthal 2018). Race was invented as the primary way to divide people who might otherwise share economic interests, and racial hierarchies that legitimated exploitation were created through ideologies of European (and later White) superiority and the related violence of territorial expansion (Mignolo 2011). The logics of colonialism and racialized exploitation remain fundamental to the exercise of modern society (Mignolo 2011), a concept termed coloniality by Quijano (2000) or racial capitalism by Robinson (1983). The valuation systems also exploited intersectional differences, devaluing non-wage work and people who do not work in formal economies, and the work of social reproduction (Crenshaw 1989, 1991, López et al. 2019).

In the case of Mora during disaster recovery, the need for external resources forced adherence to dominant economic practices. This situation resulted in a bureaucratic imperative that undermined local knowledge and ignored multiple dimensions of the community and community members' livelihoods. The HPCC (both the disaster mitigation and the compensation process) served as an extractive process that neither fully acknowledged the presence of local values nor reinvested in the processes that preserve and reproduce that knowledge. Consequently, community assets are ignored and become unrecoverable, necessitating integration into the dominant economy. Quoting Weber, a resident reflected in a local news outlet on the failure of the disaster response regime to grapple with local specificity, "The

laws of bureaucracy are incapable of dealing with individual particularities to which earlier types of justice were well suited" (Peck 2024). This quotation captures the key idea in this section: that the logics of modernity produced a disaster recovery apparatus with little capacity to see or work within local and diverse economies or knowledge.

Disaster recovery assumes and produces a singular economy

Local disasters such as the HPCC fire illustrate the imperative for conformity to dominant economic and bureaucratic systems. Crises at all scales facilitate economic transitions, further disciplining residents and institutions and creating new ways to extract value. Profits vary and fall over time as competition divides demand, but capitalist institutions are tacit seekers of new profit, and periods of upheaval manifest as opportunities for extraction and creation of new value. Intersecting crises generated by capitalism, including inequality and environmental degradation, are circular opportunities for profit accumulation. To have a singular system that operates efficiently, rationality serves as the first-order instrument underlying self-interest or profit motive and a tool through which the state preserves meaning and maintains order.

For centuries, formal rationality and coloniality wreaked havoc on diverse economies. In contrast to earlier impulses, contemporary society values social diversity, highlighting both potential scientific gains that come from diverse knowledge and seeing inherent value in uniqueness and complexity. However, dominant institutions, including academic science institutions, continue to replicate systems of power and privilege. When analyzing responses to climate change, Whyte (2017) has shown that the crisis framework justifies rapid action that attempts to appropriate Indigenous knowledge while undermining Indigenous sovereignty. He argues, therefore, that actions to achieve carbon neutrality will not make Indigenous nations and communities better off without addressing the underlying societal institutions. Likewise, unique places such as Mora that persisted despite the disciplining forces of modernity could paradoxically be destroyed by the apparatus assisting their recovery after disasters, even with an emphasis on respecting diversity and autonomy.

Environmental disasters have become opportunities to force communities to adopt market tools and systems that entrench capitalist logics at the expense of local ways of life, values, and worldviews. Following extreme events, external actors offer aid and assistance that carry with them influence and authority. Klein (2007) analyzed how disaster recovery regimes facilitated economic and societal restructuring rather than supporting the recovery of diverse economies and local institutions. She highlighted intersecting processes: the highly paid contractors that benefit from the devastation and extract resources from impacted communities, and economic shock therapy that promotes a free market ideology in the interests of investors. Adherence to dominant institutions happens at different scales and everyday bureaucratic interactions: from the market valuation of individual properties and lands to enforcing compliance with policy for greater efficiency or to reduce future economic loss from extreme events. Harvey (2001) coined the phrase "spatial fix" to explain how new forms of development become places to sink capital. From the scale of microfinance (Roy 2010) to the national economic restructuring (Harvey 2005), capitalist economic shocks lead to participation in systems of indebtedness and forced compliance with systems that extract value from people and places (Federici 2004). Dominant capitalist institutions, therefore, produce crises but also become entrenched through them.

Vulnerability and low adaptive capacity have become discursive tools in disaster- and hazard-related work that facilitate ignoring and overlooking how local people actively shape and adapt to their environments as well as their priorities, practices, and policy insights (Gaillard 2012, Faist and Schade 2013). The social vulnerability perspective fails to center community knowledge or name intersectional oppressions or causes of the situation (Jacobs 2019). Labeling communities as damaged (Tuck 2009) or viewing their situations as a deficit (Barnett 2020) opens local areas up to external control, justifying state violence and causing compounding damage. It eliminates the need to center community priorities (Dorries and Harjo 2020). Because of these effects, people become "at risk of material injury" following extreme events associated with climate change as well as by the interventions to address climate change and its effects (Marino and Ribot 2012:323).

Since the 1980s, disaster recovery efforts created space for implementing neoliberal policy agendas (Schuller and Maldonado 2016, Pyles 2017). Pyles et al. (2017) link neoliberal disaster governance to "poverty governance." In New Orleans after the 2005 Hurricane Katrina, for example, the public school system was rapidly restructured into one in which all schools were chartered based on a school choice model, a model that has emphasized ideas of individual self-interest over collective well-being (Schuller and Maldonado 2016). After Hurricane Katrina, the treatment of impacted areas as "blank slates" justified radical change that superseded local ties and claims (Nelson et al. 2007). Rivera (2022) has observed how viewing frequent disasters as discrete events furthers racial violence and dispossession, while Jessee (2022) has shown how climate action can reinforce racial capitalism. Economic precarity following disasters compels individuals, communities, and countries to accept assistance, which then disciplines them into dominant practices that devalue local knowledge and value systems. Without intentionally addressing power relations, the crisis framework reinforces dominant and destructive power systems while obscuring whose interests will be served and which power will be strengthened in the process.

Environmental disasters are becoming more frequent, and climate-related phenomena and disaster recovery and adaptation are active areas of research. Peek (2022) highlights that disaster and hazards research have long been interdisciplinary and problem focused. Both disaster response and climate adaptation concentrate resources and action in ways that bring scientific contributions to living spaces and communities. These factors make disaster research and recovery critical areas to develop spaces of convergence. In New Mexico, climate change is increasing drought and dryness and changing precipitation patterns, leading to decreased snowpack and more extreme precipitation events. This situation compounds the problems that have arisen from a century of forest management that intended to stop natural fires but which, instead, created the conditions for the fires that have become common. Extremely dry conditions and excess fuel intensified the HPCC fires and exacerbated the subsequent flooding that damaged Mora.

In Mora, despite events to facilitate residents' participation in the recovery economy, the apparatus relied on heavily privatized contractual systems with outside consultants, with little to no guarantee that such economic multipliers would be reinvested in the community. Locals with equipment and expertise either did not have the formal credentials or were perceived as having too little capacity to do much of the work. The formal processes of compensation and reimbursement stymied the economies and aid that could have developed. Because of the fires, residents were also denied access to public lands, further limiting their livelihoods. Without making space for the porous systems that encapsulate communities and their many ways of life, illegible economies will be submerged and possibly drowned by the accelerated injection of capital experienced during disaster and recovery efforts.

Modernity is not totalizing

Despite the efforts of the modern state to maintain its order, it has never been totalizing. Instead, diverse economies exist alongside, outside of, and within dominant paradigms. Gibson-Graham (2008) is largely credited with conceptualizing how one brings diverse (i.e., underrepresented, hidden, and alternative) "economic activities to light in order to make them more real and more credible as objects of policy and activism." In doing so, they connected the practice of community engagement with a broader conception of knowledge production (Law and Urry 2004, Callon 2005).

Rather than simply asking a question about the erosion control properties of a brush system or the critical temperatures of accumulated fuel, research can also accept supplementary questions such as "How do community response mechanisms account for complimentary or alternative solutions?" This process allows knowledge production to pose questions that imply numerous other considerations: "How can research support diverse economic landscapes?" "How can our work open up possibilities for or recognition of new economies?" "What kind of world do we want to participate in building?" Anderson (1983:25) noted that "no community, even the most imperialistic... [has been able to] consider itself coterminous with humanity." Beneath the layers of spaces legible for policy intervention lie myriad hidden spaces by force or choice, recurrent reminders that neither intent nor dominance builds a singular system.

Incoherent convergence science could be an act of resistance in the face of disaster responses that undermine novel possibilities for resilient and sustainable futures. The theoretical foundation of what we are calling incoherence follows from Marx, complicated by Resnick and Wolff (1989), and again by Gibson-Graham (1996). We add to these classical texts work by Escobar (2018) on pluriversality and Crenshaw (2019) on intersectionality. However, it is also substantiated by Dona Gabrielita, the famous *curandera* of the Mora Valley, who transmitted her knowledge through roots and plants, many of which were destroyed by the wildfire. It is embodied by artists such as Freddie Olivas, whose representations of daily life near the old mission houses in what was once the main town square and whose landscapes remind people of the Lebanese merchants who established themselves in the early 20th century through systems of barter and agreements with local farmers that have withstood recessions and global conflict. In this framework, power is conceptualized as a set of practices scattered over a landscape: in families, neighborhoods, households, organizations, and states, and in private, public, and social enterprises. At any time or place, it is conceptualized as an open question, rather than a presumption.

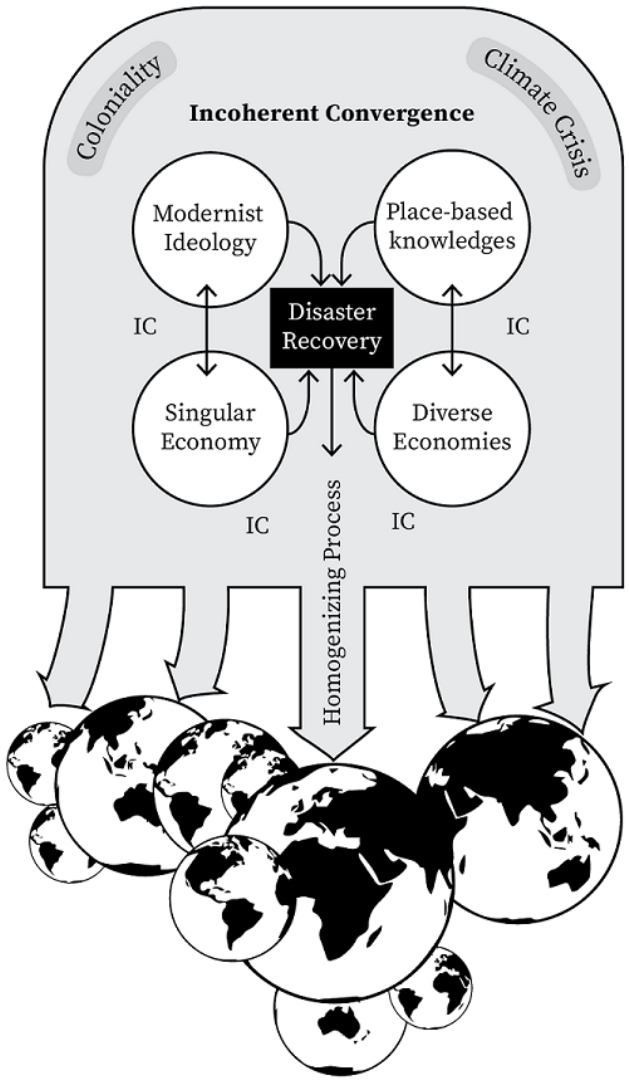
As disciplinary as they may be, dominant systems can never fully encompass the diverse, multiple, and distinct human forms of living. Sometimes, they must accept the more carnivalesque parts of their body. In academic knowledge, this means recognizing that they need not always emphasize the canonical or minor systems of knowledge production, particularly systems that they may unwittingly see as uncivilized and deserving of domestication simply because they cannot access their inner workings (Simons 2019).

Disaster response (including research) often fails to alleviate suffering because, in current practice, it does not deeply engage with impacted communities (Peek 2022) and does not easily see or value economic forms that hold meaning to local residents. For example, given that the "decrease in the fair market value of single identifiable property in U.S. dollars" (per U.S. Internal Revenue Service Revenue Ruling 99-56, 1999-51 IRB 676) is the accepted unit of measurement for the U.S. Federal Emergency Management Agency, diverse economies that exist outside of dollar-based market exchanges are excluded, unrecovered, and unrecoverable. How, then, can one be supported, compensated, or even engaged when, for instance, a heritage plant used to treat sickness in the community may now be irrevocably lost both as a practice and as a medicine within the community? In places such as Mora, New Mexico, where much of the economic activity is in discreet practices that are not monetizable, these considerations are likely to be ignored, denied, or reduced to a commoditized representation of its true value.

The strength of multiple economies in place prior to the HPCC fire was reflected in the multifaceted mutual aid, defined as efforts to mobilize community norms through moral obligation and kinship relations (Rivera 1984, Rodriguez 2006, Salmón 2012, Kimmerer 2013). These informal economies of care are put to work in times of crises and in disaster response, as much as they exist in the everyday of community norm creation and social network building. In Mora, mutual aid economies quickly responded to the wildfires to care for acute and immediate community needs: to secure buildings; to share food, water, and fuel; to find neighbors over back roads; to dig ditches; and to care for young and old, human and non-human. This response all happened within, besides, and without regard to formalized pathways of emergency response. Emergencies may activate or expose mutual aid networks in new ways. In the case of Mora, mutual aid economies' social networks and resources compose part of its way of life and were immediately activated during the disaster.

The features of modernity that have been discussed herein can be imagined as an organism (we have chosen a jellyfish to think through the simultaneously transparent and mysterious processes at work during a crisis; Fig. 1). In summary, modernity is the ideology that drives crisis, which drives the production of a singular economy, but cannot fully produce a totalized result. We describe this process as "incoherence," which in the context of Mora is next explored further.

Fig. 1. As bureaucracies respond to crisis, modernity imprints a process that shapes the realities of those affected by crisis. Depending on how much place-based knowledge has adopted modernist ideology, the "tendrils" reveal how every encounter between the dominant process and each community produces similar but distinct realities, i.e., a pluriverse.



INCOHERENCE IN CRISIS, MORA, NEW MEXICO, USA

The situation in Mora shows how the diverse, intersecting economies that existed prior to and within a disaster can be paradoxically destroyed by the formal disaster recovery apparatus precisely as it is rendered legible by dominant disaster recovery processes. In this section, we draw on qualitative research conducted by the research team since the initial moments of the HPCC fires, including participation observation in disaster response spaces such as online meetings, collection sites, and resilience fairs; collection of archival and ephemeral documents such as fire reports, formal and social media documentation, and informational materials about recovery processes; and interviews with residents. This project emerged quickly as the flames spread and the extent of the disaster became clear. Our methods were responsive, flexible, and iterative, acknowledging the dynamic of the disaster itself (Averett 2021, Small and McCrory Calarco 2022). The positionality of our research team, including a resident of Mora, an instructor in a class with a community-engaged component in the area, and a student conducting in-situ research in the area, among our other identities, has aided access to spaces and individuals affected by the fires. This conceptual piece has resulted from discussions happening across different research projects, including a separate qualitative study, an ethnography of the wildfire survivors, and a compensation framework leading to a more conventional economic analysis. We reference herein observations made from these studies-in-progress to lay bare some of the conceptual issues we confronted within those other projects, issues we felt contributed to the larger discussion on convergence science, equity, and justice.

Although shaped by modern ideologies, processes, and structures, Mora is diverse

Mora's history as doubly colonized persists in contemporary structures. The Spanish conquered New Mexico seeking natural resources, primarily gold, but the mythical seven cities of gold never materialized. In the 17th century, local Puebloan peoples mounted the only successful revolt against Spanish colonization in the hemisphere. The Spanish reconquered the region 12 years later, awarding land grants to privileged European settlers to support its settlement (Gonzales-Berry and Maciel 2000).

The rough terrain in the Sangre de Christo mountains shaped Mora's development. It separated Mora from the Mexican government far to the south, and left it relatively isolated from the rest of New Mexico as it transitioned to a U.S. territory in 1850 and into statehood in 1912. The northern expanse of Mexico was ceded to the United States in the Treaty of Guadalupe Hidalgo (U.S. National Archives 1848), which specifically addressed the ability of residents in the transferred territory to remain on their land and retain control over it. Indeed, Article VIII specifies that "property of every kind ... shall be inviolably respected." Nonetheless, in the following decades, these simple provisions were complicated by legislative and judicial interpretations in the United States, which sought to open the area to settlement and management by U.S. citizens and institutions in ways that violated the spirit of the Treaty (Griswold del Castillo 1998, Lane 2024). One result of incorporation into the United States was the transfer of much of the collectively held and commonly managed lands (which had, under Spanish and later Mexican oversight, been protected through their status as land grants) into federal and, later, state hands as "public lands" (U.S. Government Accountability Office 2001, 2004).

This history of collective land-based heritage and land dispossessions by the U.S. government are crucial parts of the story of the HPCC fire. The emergent mistrust of federal and state recovery efforts and the poor enrollment in them reflect these layered histories. This mistrust is exacerbated and complicated by the U.S. Forest Service's responsibility for the fires. Mora came into existence through conquest, but it was never fully integrated into the logic of its conquering nations. To this day, Mora remains imperfectly disciplined within the United States (Marsh 2008); it

remains dominated by Hispano descendants who continue to speak a Spanish dialect of an isolated region (Romero 2023). Approximately 54% of Mora County residents speak a language other than English in the home, a far higher proportion than the national average of 22%, and the New Mexico state average of 33% (U.S. Census Bureau 2024). Further, while 93% of adult Mora residents have graduated high school (a percentage higher than the national rate of 89%), the relative per capita income is only $40,000 per household or only 54% of the U.S. average (U. S. Census Bureau 2024). The rate of Mora residents in poverty (21%) is nearly double that of the national county average. However, homeownership, a metric of social stability within modernity, far exceeds the national average: 90% of Mora residents live in owner-occupied housing compared to the 65% national average (U.S. Census Bureau 2024). By pure data accounts, Mora is a vastly rural, place-based economy that does not easily fit into the profile of modernity that defines an economy. As Marsh writes, "The situation is just as true in 2008 as it was in 1930: people in Mora County primarily cobble together a living out of many activities, most in the informal economy" (Marsh 2008:48). In a region where generational land ownership has precipitated subsistence economies such as livestock herding, hunting, tree farming, and firewood collection and sales, U.S. Census Bureau data alone are not accurate markers of good livelihoods. Instead, we must consider the historied narratives of residents manifesting place-based relationships that extend beyond the reach of formal metrics of economy and poverty.

Mora has absorbed and rejected different parts of the modern state in its historical evolution. Another way of saying this is that it chose to preserve parts of itself that may not have made sense to others while accepting and adopting parts that did. For example, Mora is the only unincorporated county seat in the United States. Its decision to remain unincorporated is evidence of a resistance to dominant economic and political structures. In fact, it has resisted incorporation several times since its establishment as a county in 1860 in favor of more traditional land-based governance practices (Lamadrid and Arellano 2015). It is notable that Mora's history of governance is not readily available as a matter of historical fact but rather as a history of stories, histories that can survive beneath the threshold of bureaucratic legibility that disaster response teams are now requiring of this community (Meléndez 2017). These stories serve as a parallel archive of systems of mutual aid, community concepts of shame, risk, and *seguranza* (insurance) that manifest first as relational codes that are transmitted over time as stories inherited by others rather than by systems of probate. There has never been a municipality or village of Mora, meaning it does not have formal articles of incorporation that constitute it as a legal or public authority in a way that is conventionally understood. Moreover, because it is not a village or municipal authority, It does not organize as a political body that lobbies for influence in relation to other entities in the state. Therefore, it does not set an agenda for county governance in a way that a country seat normally would. Hence, it does not contain tax-collecting abilities, nor does it serve as the forum for disputes or resource allocation, which produces a significant disconnect between itself and other institutions that have maintained and developed municipal governance for decades (and centuries; Lamadrid and Arellano 2015). The collective management of water and the communal relationships within land grants created enduring practices that are enlivened and constantly (re)produced through peoples' engagement with them. Indeed, only 39% of the residents of Mora engage with formal economies (compared with the national average of 63%; U.S. Census Bureau 2024). This number suggests that Mora has relatively low involvement with the formal labor market but does not capture the diverse, overlapping, and land-based informal economies upon which many people in Mora rely.

This situation raises the question: How can people within Mora be adequately compensated by the dominant system when the dominant system can only assign value through tools that are inconsistent with local values? Disaster recovery often fails communities, especially rural communities with strong place-based ties, because economies are more than what is on the surface, the commodity form, and the rationalization of processes that reinforce commoditization.

Property is often passed down to heirs without formally transferring the title. Similarly, heritage, territorial history, and ecological knowledge that reside in land-based systems cannot be easily or fully valued via the logics of the market. A vignette from recent fieldwork in Mora makes this clear. Many families were ranchers with intergenerational knowledge about the land and cattle ranching. The cattle also transferred knowledge across generations by teaching calves the routes to summer grazing allotments, allowing ranchers to rely on cows to make their own way to the grazing area and return as fall arrived. After the fires, new cattle could be purchased, but no amount of money could replace the lost animals' knowledge, which was a key aspect of ranchers' livelihood. It also does not account for the fact that cattle serve as an alternative currency to pay for schooling to this day, a practice that dates to the 1930s, when families would send children to schools such as the Menaul School in Albuquerque in exchange for cattle, with the acknowledgment that such knowledge would stabilize the community's connection to other ways of life outside of Mora.

These relationships to land, water, and animals are not adjudicated by market logics. Histories of collective land and water governance long shaped economies in which logics of mutualism and collective care exist alongside and sometimes supersede exchange and monetary values. The repeated assumption that the people of this region are incapable of producing viable economic systems belies the stark historical record that they have resisted those systems of economic valuation for reasons that, if voiced, have also been marked by punishment or alienation.

Disaster recovery forces formalization and monetization upon Mora's diverse economies

Mora residents simultaneously participated in multiple economies: jobs in formal and informal wage economies; community members who reside at least part-time elsewhere but continue to engage in shared practices, care work, and financial support; neighboring and other forms of mutual aid; and ongoing interdependence and subsistence activities with land, forests, and water. These multiplicities were recognized in the processes established for disaster recovery. For example, after the fires, the

State of New Mexico established a "Full Service Debris Removal Program." The costs were covered by the state, although residents had to contribute any amount their insurance paid. However, the program prohibited property owners from beginning work on their properties. It used strong language that discouraged residents from attempting to do the work themselves (because it might only be partially covered by insurance). As residents returned to their damaged homes, they were discouraged from working with neighbors to clear and restore their land because beginning such work could affect future compensation, thereby slowing actions to repair and rebuild. These logistics undermined existing relations and economies of care, preventing people from using existing resources to help each other. Instead, residents could become subcontractors to firms hired to manage the process if they went through the formal process to become a vendor. As a result, work was delayed months after the wildfires, still remains incomplete, and has been the cause of growing hostilities within the community.

The compensation process explicitly stated that only economic loss could be compensated, which could include informal economic activity (if it was formally valued, often requiring the assistance of outside experts). The generational knowledge that ranchers' cattle herds held, allowing them to travel to grazing lands independently, was not documented by science and, therefore, was invisible and valueless. The disaster recovery regime can only value that which is formalized and made visible and, therefore, is prone to overlook ecological networks that sustain generations, disrupted social networks, the myriad forms of unspoken actions, and care that comprises parallel forms of economic transactions.

Because of this, Mora's recovery was relatively unsupported compared with that of nearby Pendaries. Pendaries is a community of many second homes and a golf course. It was a part-time retirement community whose members largely constituted a privately owned corporation able to navigate the recovery apparatus, thereby receiving the privileges afforded by the dominant system. Much of Pendaries is part of the greater Rociada area, which was owned by Hispanic families of the Mora Land Grant since 1835. Much of these lands were sold to entrepreneurs after the Treaty of Guadalupe Hidalgo, notably Jean Pendaries in 1868 and later C. D. Leon, a wealthy businessman from Dallas, Texas, who raised cattle, which invited further investment from ranchers across the United States and Canada. This investment and the subsequent dividends encouraged an incorporated homeownership system, leading to the development of a resort in 1969 that converted part of the Pendaries Ranch into a nine-hole golf course. In contrast to the greater Mora region, this area had been privatized and incorporated while Mora remained unincorporated. Part of Mora's history of resisting incorporation may have been due to the purchase of what was the Mora Land Grant (including a significant portion of prime grazing land) by perceived foreigners, a divide that ran along racial and ethnic boundaries (https://www.newmexicoskyline.com/about-pendaries/). Historically, homeowners in Penderies do not rely on the same types of land- and relationship-based economies that have slowed the recovery efforts in Mora, and thus were well fitted to the disaster recovery apparatus.

Mora maintains incoherent economic forms that support and sustain people's lives and cultures

During the initial HPCC emergency, active fires left a mandatory evacuation order in effect. However, many residents of Mora stayed in their homes and communities against orders, fearing that if they were not present, their properties and livelihoods would be lost. The U.S. Forest Service coordinated the emergency response during the active fires and prioritized wildland fire fighting to stop the fire burn area from expanding. Thus, community members witnessed neighbors' homes burning without active response by U.S. Forest Service firefighters. Under this environment, the local volunteer fire department and other community members initiated their own emergency response centering around their firehouse. They met each morning in person to plan for the day with limited fuel and a lack of radio and cell service. Together, they used their personal and communal knowledge of the region to determine whether homes or structures were in danger. They drove on backroads, not listed on official maps, to reach far areas of the county and protect structures from burning. The fire chief and his son even fended off fire at their own family's and nearby neighbors' homes when the evacuation orders were in place. The U.S. Forest Service did not approve this model.

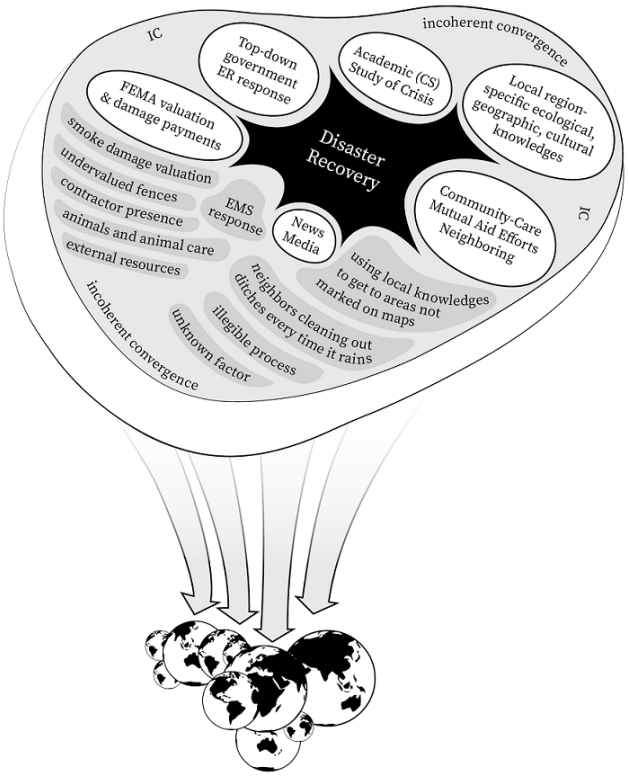
Mora's subsistence food system is another example of diverse economies threatened by the HPCC fire. Seasonal hunting, small-scale agriculture, and food storage in freezers and elsewhere provide important sources of food and a means to maintain food availability even when the winter prevents many other economic activities. However, the loss of gardens, foraging spaces, hunting grounds, and, in a particularly salient way, freezers with stores of meat, meant a loss of livelihood in ways that are difficult to quantify. Local firefighters knew this and had situated knowledge that helped them to identify and prioritize the vulnerable areas that were most valued locally. Local knowledge and care structures already established by diverse economies, including the local volunteer fire department, were autochthonously organized to center local values within the disaster response.

In the HPCC disaster response within Mora, local traditional and ecological knowledge (Estes et al. 2021) was not recognized, valued, or centered. Instead, disaster response has prioritized the economies and knowledge that are most legible within a modern social, scientific, and governance system. This situation is an important failure of science and of the disaster recovery apparatus that an incoherent convergence science framework can help to overcome. Elaborating further on Fig. 1, Fig. 2 illustrates the "incoherent" structure within the Mora case, representing both the linear and nonlinear elements that manifest within that system.

TOWARDS AN INCOHERENT CONVERGENCE

Convergence science that seeks to explain or enforce a coherent world, even if attempting to work across methodological and disciplinary epistemic diversity, misses the unique opportunity to build real-world solutions that work across the multiple worldviews within the complex spaces that we study. The strengths of current scientific methods become weaknesses if they reify practices that limit the range of novel solutions or lead to as many societal problems as they resolve. While conventional science

Fig. 2. A microscopic view of a "jellyfish head." Here, different knowledge and processes converge ambiguously, distinctly, and "incoherently." Dominant systems can neither comprehensively see nor avoid the constant reproduction of these multiple worlds; attempts to do so intensify failures of engagement with diverse economies.



continues to be a credible and powerful way to engage with the world, it is enmeshed in bureaucratic capitalism that asserts dominion over other systems of credible and rational thought. Without recognizing this process, dominant systems are seen as the privileged and primary way to develop knowledge for action rather than one way among many.

To expand our current scientific thinking, we need places of encounter that allow science (and scientists) the opportunity to step outside dominant scientific institutions (e.g., scientific methods, funding paradigms, etc.). Doing so can create space for convergence science to arise from and through events and spaces in which the knowledge that is incoherent within dominant scientific institutions can become knowable. Incoherence provides the invitation to embrace creativity, novelty, and diversity in and among disciplines, and it resists the need to make one logic system legible to or integratable with another. Autochthonous ecological knowledge brings new ways of approaching problems that can see them in completely new ways and leverage existing resources that are otherwise overlooked (Kimmerer 2013, Estes et al. 2021). Artistic practice can provide unprescribed, expansive encounters, moving beyond the limitations of scientific methods and the confines of what is knowable (Magrane 2015, Clark et al. 2020), and create space "in which knowledge systems could co-exist in respectful, sometimes generative, dialogue" (Mullen et al. 2023:14). Indeed, there is a pluriverse of experiences, knowledge, and practices that may not make sense to us now but that may hold exciting possibilities for the future (Escobar 2018).

Mora is unique but not exceptional, and we use Mora's situation here to encourage convergence science to make space for the diversity of knowledge and practices, even when illegible, in our pursuit of climate-related solutions. Histories of conquest, colonization, and imperfectly enforced integration with modern political economic structures left Mora perhaps more explicitly reliant on non-market, informal, and subsistence livelihoods, but there are diverse economies everywhere, even when they are illegible, invisible, or underground. Building capacity (the metacognitive scaffolding) to learn across differences is a key challenge and reward within convergence science.

The limitation of convergence can be illustrated by recognizing the incommensurability of Mora's economy with the tools that have been used to value loss of livelihoods or prioritize ecological restoration within HPCC fire recovery efforts. Understanding diverse economies is a fundamentally different aim than simply recognizing informal economic activity or land tenure. Once the market receives such values in monetary terms, it becomes susceptible to exploitation by categorizing goods and activities and rendering them objects of exchange.

Economies change, and diverse economies are open to the various tensions whereby communities allocate resources, make a living, build kinship ties, and shape their futures. Crises create possibilities to see in new ways what had been unresolvable. To deepen convergence science, researchers may need to recognize the pluriverse, or multiple economies and worldviews in given places at all times (Escobar 2018). Research processes are implicated in dominant forms of capitalism and notions of growth and progress. Without a willingness to interrogate dominant science itself, the solutions generated will be limited. An incoherent convergence, in contrast, encourages the complementarities and synergies across disciplines, epistemologies, and ontologies without requiring one path. This approach requires naming a dominant system as one economic form within a constellation of diverse ways to see and know, leading to a fracture, the space for a revolution in science to open new ways of thinking to solve environmental and social crises.

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No data or code are associated with this manuscript.

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