International Journal of Communication 14(2020), 4578–4598 1932–8036/20200005

Formulating Deformation: The Flows of Formless Information

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If misinformation is information without truth, this article recognizes deformation as a set of processes through which information loses its organization. Deformation grants audiences and intermediaries the agency and the burden to refashion bits, pieces, and fragments of information into coherent and meaningful formulations. Though not necessarily problematic, deformation functions as a pervasive precondition of information disorder. After deductively deriving the concept of deformation, this article presents a case study involving the public communication of physics that describes some of the forces that can facilitate deformation, including challenges of organizational coordination, economic incentives, and technical affordances. This article argues that studies of misinformation should attend better to the informational environment while recognizing that the continuity of information across time and space should be regarded as an achievement.

Keywords: disinformation, misinformation, information flow, science communication, information theory, information disorder, journalism studies

Ira Glass begins a recent episode of *This American Life* (2019) about political conspiracy theories by asking "When are we supposed to be connecting the dots? When are we not supposed to be connecting the dots? Because, friends, there are a lot of dots" (8:43). Glass's description aligns with recent scholarship suggesting that dis- and misinformation often consists of fragments of information that have been taken out of context or combined in misleading ways (Garimella & Eckles, 2020). Though scholarship has offered useful insight into how and why misinformation is produced and circulated, it remains unclear both what exactly are these bits and pieces of information that constitute misinformation and conspiracy theories, as well as what forces and dynamics within media and information systems produce them in the first place.

Scholars have recently offered many explanations for what they see as the growing problems of misinformation and disinformation. Some situate misinformation within changing cultures or the emergence of a new regime of posttruth (Harsin, 2015). Others look to psychological explanations as to why we share misinformation (Southwell, Thorson, & Sheble, 2018), its underlying political economy (Oreskes & Conway,

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Date submitted: 2019–07–23

[1] I would like to thank my doctoral dissertation committee, Daniel Kreiss, C. W. Anderson, Barbara Friedman, Ben Peters, and Adam Saffer; the research team at the Reuters Institute for the Study of Journalism; and the anonymous reviewers for their guidance and feedback.

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2010), its varied social functions (Marwick, 2018; Polletta & Callahan, 2017), or the technologies and platforms that facilitate its spread (Jin et al., 2014). Each of these approaches offers insight, but far less attention has been given to the ways that the organization and dynamics of information and media systems treat the flows of information that prefigure mis and disinformation.

Decades worth of scholarship in science and technology studies has shown that facts are feeble things (Latour, 1993). Facts require support; they require infrastructures such as evidence, institutional authoritative validation, or supportive networks to retain their facticity and their validity (Marietta & Barker, 2019). But little of what circulates through media and information systems is facts. Facts are a particular formulation of knowledge (Marres, 2018) that exhaust neither the limits of information nor of communication more broadly. Rather than only considering what happens when facts lose their support, we should ask what infrastructures provide information its form and continuity, and what happens when it loses those infrastructures.

This article details some of the forces responsible for information losing its organization as it flows. It shows how, as information circulates, it can break apart into fragments, losing its order and structure. If one basic definition of misinformation is information that is without truth (Floridi, 2011), this article recognizes deformation as a series of processes in which information loses its organization—producing information literally no longer in a formation. Deformation describes the pulling apart of information to produce bits, pieces, and fragments of information. Sometimes deformation results in the circulation of fragments, but often it involves the refashioning and reassembly of those bits into something new. Rather than a type of information or content, deformation is better considered as a process of de- and reforming that occurs within the circulation of information.

Instead of understanding deformation as the exception in an otherwise stable informational system, this article recognizes that difference has always been fundamental to both information (Bateson, 1987) and to information flow (Serres, 1982). It recognizes that information is continually being unmade and remade as it moves and circulates. Across media, diverse actors break apart information flows and reform them in ways that are meaningful. Rather than be assumed, the continuity of information as it flows over time and space should be regarded as an achievement. Despite what some theorists of the "information society" have assumed for decades, it is entropy rather than inertia that guides the circulation of information. That is to say, even before considering the production and circulation of disinformation, we should recognize the ways information can be compromised and complicated.

Deformation is by no means new; however, there is reason to suspect it is increasingly common. This growing prevalence of deformation means that it is now increasingly incumbent on audiences and intermediaries to fit together the fragments into something meaningful and coherent. Deformation is not inherently bad; it produces potential information—and potential misinformation, too. Deformation represents less an information disorder (Wardle & Derakhshan, 2017) as much as a pervasive precondition for information disorder: Deformation furnishes the raw materials for misleading claims, conspiracy theories, or other problematic content. Recognizing deformation also highlights the agency we hold and the work we must perform to refashion deformation into coherent and meaningful formulations.

This article proceeds in two parts. The first deductively derives the concept of deformation from existing theoretical work on information. This includes employing Luciano Floridi's (2011) straightforward definition of semantic information as data that are "well-formed, meaningful, and true" (p. 260) to help define and interrogate deformation. The second part offers an empirical case concerning the contemporary science media system to demonstrate how specific mediations or translations can deform information flows. The case looks at three moments in the public circulation of information about direct detection of dark matter experiments to demonstrate some of the myriad forces that can animate the degeneration of information flows, including economic pressures, challenges of organizational coordination, and changes in practices of scientific self-promotion. Ultimately, this case shows how mediators of public communication interject difference into the circulation of information amid processes of deformation. It shows that even absent forms of dis/misinformation commonly recognized, the public informational landscape is flooded with the fragments of informational flows.

Compared with other common approaches, deformation suggests an alternate way of conceptualizing the production and circulation of misinformation. To gain a holistic understanding of the problems of misinformation, communication scholars would be well served by also interrogating the circulation of information more broadly. We need a better understanding of the people, things, and practices that that permit data to flow and circulate as information and those that prevent it from doing so. That is to say, scholars would benefit from not only asking what produces and circulates misinformation but also what has happened to the structures that might permit information to flow intact over time and space. More, this article suggests that misinformation might in fact gain some of its prominence and power because deformation already shapes the information landscape.

Recognizing deformation repositions both the burden and potential of our informational agency. The imperative has become not (only) to cull, filter, or discriminate among information, rather, it is to (re)produce it. This is why commentators and analysts are now ascendant—they offer to help us fit the pieces back together. It is, in a sense, the logic and necessity of remix (Lessig, 2008) that rules the day. This helps explain why, for an age supposedly defined by the flows and circulation of information, information remains rare in the actual experience of the contemporary media environment.

Situating Deformation

There have been dozens of efforts to define and characterize information (see Geoghegan, 2016; Peters, 1988). Two facets stand out across many different definitions. First, many accounts include a notion that information is fundamentally ordered. As Geoghegan (2016) observes, the word itself is "derived from Latin *informare, information* denoted the imparting of form onto matter" (p. 174, emphasis in original). For Ezrahi (2004), information is, first and foremost, in-formation—data that is in-a-formation. Likewise, Floridi (2011), who helped found the philosophy of information, has recognized across the literature a "general definition of information" as data that are "well-formed, meaningful, and true" (p. 260). This articulation aligns well with Marc Porat's (1977) famous definition of information as "data that have been organized and communicated" (p. 2), which was also adopted by Manuel Castells (2010, p. 17, fn. 25).

At the same time, there has been something of a consensus that information is also deeply associated with difference. In a sense this goes back to Shannon and Weaver (1948), for whom information is a measure of entropy or disorder of a system and is connected to the probability that a given message will occur. The more probable a message, the less information it provides. This is, the amount of information is a function of the difference from what is expected.

Gregory Bateson famously observed, "In fact, what we mean by information—the elementary unit of information—is a difference which makes a difference" (Bateson, 1987, p. 322). Beyond cryptic aphorisms, Floridi (2011) presents a clear treatment of this argument through a thought experiment involving the effort to erase all possible data contained in a book written in indecipherable pictograms (p. 85). He walks through erasing the symbols until only a blank page is left. Floridi observes this does not mean there is no data, "for the presence of a white page is still datum, as long as there is a difference between the white page and the page on which something is, or could be, written" (p. 85). He concludes, therefore, that "a genuine, complete erasure of all data can be achieved only by the elimination of all possible differences" (p. 85). This "diaphoric" definition of data ontologizes data as difference, not only as "fractures in the fabric of Being" (p. 85), but also as a "lack of uniformity between (the perception of) at least two *signals*" or between two "symbols" (p. 86, emphasis in original).

If information definitionally involves (at least) order and difference, returning to Porat's (1977) observation that information also involves the communication of data, it is important to ask how those characteristics react when pieces of information move across time and space. That is, what happens to the order and what happens to the degree of difference of information as it flows (Barwise & Seligman, 1997)?

Early articulations of the information society arguably downplayed the flow of information. Many early theorists saw the information society as an industrial (Bell, 1976) or economic phenomenon (Machlup, 1962 Porat, 1977) defined by a change in forms of industry and the types of commodities that circulate. Some of these theorists saw information as any other commodity (Machlup, 1962) that could be packaged and trucked across the country—an articulation that stressed not only its form but also the continuity of its form over time and space.

However, information is not simply a case of books that can be transported with no risk of modification. The flow of information is an act of communication. While Michel Serres (1982) has stood on the periphery of communication scholarship and theory, his account of communication in *The Parasite* offers a useful if unorthodox account of information flow. As in English, in French, "parasite" refers to both the animal that feeds off of a host as well as a mooching guest. In French, however, the word also refers to a noise or an interruption. Serres recognizes the parasite—as noise, interruption, or difference—as fundamentally constitutive of communication itself. Rather than a sender–receiver dyad, for Serres communication is a triad of sender, receiver, and parasite. On one hand, Serres asserts that there can be no a priori distinction made among these three components (p. 14). On the other, the parasite constitutes the difference between sender and receiver: without noise, the sender and receiver are the same. Explicating Serres, Steven Brown (2002) tries to imagine a scenario of "perfect communication," recognizing that

> for this to happen, there must be no possible equivocation in the reception of the signal. The only logical guarantee of such a state of affairs is an identity between sender and receiver. Such a relationship is, of course, not really a "relation," but rather the absolute harmony of similarities. (p. 7)

Ultimately, for Serres (1982), within communication and beyond,

> the difference is part of the thing itself, and perhaps it even produces the thing. Maybe the radical origin of things is really the difference, even though classical rationalism damned it to hell. In the beginning was the noise. (p. 13)

For Serres (1982), the flow of information appears as not only an act of communication but also a mediation or a translation. Translations are processes of change: "act[s] of invention brought about through combining and mixing varied elements" (Brown, 2002, p. 6). They are means of producing difference in the world. Similarly, the predominance of mediators, which modify inputs, rather than intermediaries, which do not, is a core tenet of actor-network theory. In describing actor-networks, Latour (2005) observes that

> there exist endless number of mediators, and when those are transformed into faithful intermediaries it is not the rule, but a rare exception that has to be accounted for by some extra work— usually by the mobilization of even more mediators! (p. 40)

John Law (2006) takes this a step further, describing translation as a "betrayal" (p. 57).

Working in a different tradition, Brian Southwell (2013) identifies "commentary and cooptation" as one the six types of information sharing behaviors within social networks. He observes that "current technology" gives individuals the ability to "take prominent pieces of existing content and to weave them together into an artistic 'mash-up,'" and to "further disseminate bits and pieces of relevant information" (p. 26).

These theorists attest to the fact that the flow of information must be problematized; we should recognize that just as difference is internal to information, it is internal to information flows as well. The corollary of this is that the continuity of information as it flows requires work—it is something that must be preserved as information moves over space and across time. Information flows require infrastructures to preserve the continuity of a piece of information.

When the continuity of information is not held or maintained, it can lose its order —its formation. However, arguably, we lack a way of describing when this happens. Information losing its formation is not described by misinformation, what Floridi (2011) defines as "well-formed and meaningful data (i.e., semantic content) that is false" (p. 260). Nor is it described by disinformation, which is usually seen as misinformation that is knowingly false (Jack, 2017). Nor is it "mal-information" which Wardle and Derakhshan (2017) define as "when genuine information is shared to cause harm, often by moving information designed to stay private into the public sphere" (p. 5).

Scott Lash (2002) recognizes "garbage" as information that has lost its central ordering logic. As Lash attempts to reconstruct the possibility for critical theory in the information society (p. vii), he observes that information

> is ephemeral. It works through a sequence of particulars, a collage of particulars. *Fait divers* are indeed news items, news in brief. They have no particular order: like an unconnected set of newspaper headlines or telegraph messages (McLuhan & Zingrone, 1997, pp. 62–63). There is no logical or analytic ordering. The newspaper headlines are ordered perhaps only by what sells papers: telegraph and newspaper ordered by urgency. (p. 145, emphasis in original)

For Lash, information is fundamentally disordered—deformed, held together only by "immediate temporality" (p. 145). But "outside the immediacy of real time, news and information are, literally, garbage. You throw out the newspaper with the disused food and the baby's disposable nappies" (p. 145). For Lash (2002), information is garbage when it loses its temporal context. But information goes beyond the news of the day—and has ordering logics beyond "immediate temporality." Therefore, we need an analytic that better captures the more basic process of information losing its ordering logics or its formation.

Defining Deformation

This article argues that the process in which information is broken apart into bits, pieces, and shards of information and loses (some) order or structure should be called deformation. This term aims to capture a general type of process inherent in information and media systems that can serve as a precondition of information disorders (Wardle & Derakhshan, 2017).

Floridi's three-part definition of semantic information as data that are well formed, meaningful, and true, provides a useful means of defining and describing deformation.

"Well Formed"

Deformation produces content that is not well formed. In a sense, Floridi's definition of information as "well formed" elides the necessary referent that would answer, "well formed in comparison to what?" To make sense of the changes that occur through processes of deformation, it is necessary to consider deformation as a process in which informational antecedents lose their organization.

Importantly, recognizing that difference must be theorized as internal to informational flows means prioritizing change rather than stability. It is to recognize that the stability of information as it moves from place to place, or time to time, must be achieved rather than assumed. This is, in many ways, one of the key insights of actor-network theory, demonstrated well in Latour's (1993) *The Pasteurization of France*. Latour shows how the circulation of Pasteur's revolutionary ideas about bacteria and yeast first required the extension of Pasteur's laboratory across France. Without the material infrastructures first in place, there was no way for Pasteur's work to be tested and integrated. Latour

shows how it took the extension of complex, diverse infrastructures for Pasteur's new informational flows to circulate.

"Meaningful"

Even though they are defined in part by their lack of order, the products of deformation nonetheless can be meaningful. Having lost the organization that provides some help in meaning making, deformed information requires consumers to fit together the bits, pieces, and fragments into something coherent and meaningful. That is, deformation recenters the burden of producing meaningful communication to audiences, consumers, and intermediaries.

Scholars across fields are investigating the ways in which political (Warner & Neville-Shepard, 2014), scientific (Bricker, 2013), or social (Bjerg & Presskorn-Thygesen, 2017) conspiracy theories are increasingly structuring public discussion. Similarly, "fan theories" that postulate bizarre and, frankly unlikely, explanations or predictions for movies, TV, comics, or other media populate entertainment websites and social media discussion. Scholars have suggested diverse explanations for the growing commonality of conspiracy theories (Douglas et al., 2019). Deformation, however, provides a way to contextualize fan and conspiracy theories both in terms of broader processes of the media system, and the growing burden to construct meaningful informational flows out of deformation.

"True"

For Floridi (2011), misinformation is defined by its falseness. Assessing the truth value of the products of deformation underscores the limitations to Floridi's binary approach to truth. Rejecting correspondence theories of truth—the sort implicitly assumed by many current scholars of information and misinformation—can offer alternative ways of considering the truth of products of deformation. For example, actor-network theory embraces a more pragmatist notion of truth, where it is neither a binary state nor an adjective; truth, instead, is a verb of circulation (Latour, 1999). Adopting such an approach means asking not how well the products of deformation correspond to some external reality, but rather how and how well do they allow truth to circulate. Rather than assuming that all deformation results in content that is necessarily false, deformation must be considered in the wider context of the de- and recontextualization of content. To build on a metaphor Latour (2005) uses in describing circulating reference, the recontextualization of deformation is like trying to build a new electrical circuit from the scavenged pieces of several others—a bit of wire from one, some solder from another, a light bulb from a third. Rebuilding a working circuit from these bits and pieces might be difficult, but it can be done (Brennen, 2018). Rather than see deformation as part of another "informational disorder" (Wardle & Derakhshan, 2017), it is more a fundamental reality of the contemporary media system: a precondition not only for informational disorder, but informational order as well.

Case Study: Deformation and Dark Matter

While using Floridi's definition of information helps to define deformation, doing so provides little insight into how deformation actually proceeds within the contemporary media and information system. To

understand better how—even absent malicious intent—myriad pressures and forces can introduce noise into information flows, this article offers a three-part empirical example tracing different translations involved in the circulation of public information about astroparticle physics. While there are likely many forces that can disrupt information flows, this example adopts a logic of discovery and reveals three: growing norms and expectations of self-promotion within science, challenges related to institutional coordination, and economic incentives.

Importantly, studying information flows concerning science should not be taken as a suggestion that scientific information is the only "real" or "true" form of information. However, science communication foregrounds transformations involved when institutionally validated pieces of information become public. Notably, none of the examples below involve explicit disinformation. Rather, the case demonstrates how other types of forces and dynamics at play can break apart information as it circulates.

This case involves a set of astroparticle physics experiments attempting to reveal the particles that many believe constitute dark matter. Even as astronomers estimate that dark matter makes up as much as 27% of the total mass of the universe, we still do not know what it is (NASA, 2020). Since the early 1980s, a group of multi-institutional collaborations (see Shrum, Genuth, & Chompalov, 2007) have built detectors to reveal signs of dark matter. Notably, none of these experiments are widely considered to have seen evidence of dark matter.

The findings presented below derive from data collected for a larger project investigating the flows of public communication about direct detection of dark matter experiments (see also Brennen, 2018). Direct detection of dark matter experiments was initially chosen because, although there is great deal of (internal) technical discussion and controversy over the interpretation of findings and best directions for future research, they have attracted little public controversy. As such, direct detection of dark matter can help reveal the workings of more routine or normal forms of science communication in ways that other well-studied cases, such as climate change, biotechnology, GMOs, or vaccines, cannot.

Data for the three cases described below come from an interpretative textual analysis of 479 English-language news articles from August 1991 and July 2016. Every article that could be found from across news outlets was collected through searches of news outlet websites, archives, and other aggregators, including Lexus Nexus. Data also derive from 60 semistructured interviews with physicists, science journalists, and science communicators who have researched, covered, or communicated about direct detection experiments.

Self-Promotion, Twitter, and Deformation

On October 30, 2013, dozens of journalists, politicians, administrators, and physicists gathered in the seminar room of the newly built Sanford Underground Research Facility at the Homestake gold mine outside of Lead, South Dakota, to hear the results of a major experiment. The two spokespersons of the Large Underground Xenon experiment (LUX) stood on stage to announce the findings, and the collaboration produced a series of tweets about the event. These tweets included one meant to communicate the results that were being announced by one of the spokespersons of the experiment, Rick Gaitskell.

Figure 1. Tweet from @luxdarkmatter October 30, 2013.

Although the text of the tweet includes at least five distinct pieces of data, this tweet remains unclear. First, though Rick Gaitskell is well known within the dark matter community, the tweet lacks the credentials or affiliations that would indicate who is his. Next, the tweet distils down the key findings from this release into a single sentence with four pieces of data. With no context, the 85 days could be many or few. "LUX got 160 events," suggests that LUX found something. However, the next phrase, "consistent with background-only hypothesis" is a jargon-filled way of saying that these 160 events were not dark matter. People familiar with direct detection would understand this, but many laypersons might not. Finally, "with *p*-value 0.35" announces a value that makes the findings appear to not be statistically significant. The one reply to the tweet (see above) noted this confusion. If not statistically significant, does this mean these events might not be backgrounds? Could they have found dark matter? Or does this simply mean the collaboration cannot be certain of their results. If so, why are they holding an announcement? The subsequent tweets produced during the press conference do little to clear up the confusion.

This one tweet indicates two different types of pressures or forces that can contribute to the breaking apart of informational flows. First, Twitter's technical affordances facilitate users pulling images, quotes, ideas, frames, sentences, and/or data points from the contexts in which they originated and within which they make sense. Here, this one tweet attempted to condense into 140 characters the results from an experiment that not only ran for 85 days, but took years to design and build, cost millions of dollars, and involved hundreds of people. In doing so, this tweet plucked out five pieces of data, each of which was removed from the larger context that granted them meaning and truth.

Second, this tweet is part of a public relations effort by the collaboration. Since the 1970s, many scientific organizations, such as national laboratories, have been adopting "more assertive public relations" (Traweek, 1988, p. 22). Some have observed an intensification and professionalization of these efforts in

the last several decades (Bauer & Bucchi, 2007). This tweet was part of a campaign that included the press conference, a series of press releases, news-style stories appearing in institutional publications, and news stories written by independent journalists.

In announcing these results, LUX did not claim that it had found dark matter. Rather, it announced that it had proved itself to be the most sensitive existing detector. However, many informants involved in this event indicated that the fact that the collaboration organized a press conference led many journalists and physicist to believe ahead of time that the collaboration would be announcing that it had found dark matter. Also, both Rick Gaitskell and Dan McKinsey, LUX's co-spokespersons, acknowledged in interviews (personal communications, November 3, 2015; September 22, 2016) that the collaboration believed announcing a result in October would help the collaboration bolster its chance of winning a major grant from the NSF and DOE for the next iteration of the experiment, LZ.

The collaboration appears to have made two strategic calculations in producing this tweet and the larger results release. On one hand, the collaboration strategically exploited existing expectations about what sort of announcement warrants a press conference to generate additional publicity and help secure future funding. On the other, it exploited Twitter's technical affordances to help preserve some ambiguity in their findings. That is to say, this tweet was part of an effort to strategically fracture and reform information about the experiment to make the experiment seem as though it had more significant results than it did. Doing so not only helped generate more publicity for the experiment, it aided the attempt to demonstrate to the funding committee that the experiment deserved additional funding.

Organizational Coordination, Press Releases, and Deformation

Even as scientific organizations embrace new forms and formats of public relations (Bauer & Bucchi, 2007), press releases remain an important media strategy for multi-institutional collaborations. A close look at the ways that direct detection collaborations produce and distribute press releases highlights how the challenges of coordinating public relations activities across multiple organizations can facilitate the deforming of informational flows about science.

After negotiating which institution will take charge, the process of producing a press release begins with initial conversations among a variety of different stakeholders. Often, this means that dozens of different institutions negotiate each line of a press release, attempting to best position their own researchers. One communication officer explained that the process attempts

> to make sure that everyone is represented . . . it's important that it doesn't sound like it's coming from any one lab, you don't want to give anyone short shrift. (G. Roberts Jr., personal communication, June 30, 2016)

After a first draft has been laboriously worked out among the key stakeholders, many press releases still go through a rigorous review process at the institution leading the effort. One external communications manager at a major U.S. national laboratory, described seven different steps of review after all the different scientists and institutions have already collaborated to produce the release.

Once a press release has been written and reviewed, and the embargo date, if there is one, is at hand, the release is ready to be sent into the world. If a major journal is involved, it will often send the release to the biggest science news wires: EurekaAlert!, News Wire, and Alpha Galileo. If not, the lead laboratory often will do this. The lead laboratory will also send the release to its own network of journalists and connections. Like in any organization, good communication or media relation officers maintain relationships with science journalists.

Yet lead labs also tap into the networks at each member institution to help distribute press releases. Katie Jurkewicz, the director of communications at Fermilab, explained that keeping all of the follow institutions involved throughout the process of producing a press release also helped this aim:

> As lead [lab] we need to try to be as inclusive as possible, because if you want to raise a national or international profile about a given project and you want to have it in markets all over the country, the best way to do that is by using the universities that are in those markets, because they know their journalists, they can get their information out in the media in a way that we, sitting in Chicago, couldn't for example. (personal communication, May 6, 2016)

Collaborations often involve institutions from across the world—and each institution usually has a communication, media relations, or public affairs office that has its own network of journalists and publications. These networks can include an institution's own set of publications, as well as journalistic outlets in local communities, or even connections with journalists at national outlets. Importantly, having locally rooted distribution networks can help stories stand out in a crowded media landscape.

Yet, to motivate follow labs to tap into their local networks, they are allowed—and often expected—to rewrite press release before distributing them across their own networks. Usually, this means highlighting the work that their researchers have done and the contributions they have made to the experiment. Yet this can also mean more substantive changes as well. As Manuel Gnida observed for one press release about LUX,

> I think I tried to make it less technical, and of course I wanted to flag SLAC higher in the text than the original press release, [which] didn't quote one of our SLAC researchers who was the cofounder of LUX, Tom Shutt, so I included something from him. But I see here I did keep quotes from the original, it's always good if you already have a good draft that has already been reviewed so it's something you can work with. (personal communication, June 28, 2016)

Once a follow lab has revised the release, it might be reviewed by the administration of that institution, but neither the research collaboration nor the other institutions usually review the new release. This means that after weeks of collaborative work and review, science writers at follow institutions can essentially throw out carefully worded releases to promote the role their researchers and institutions have played in the collaboration. Yet being able to rewrite releases provides incentive for organizations to work their own distribution networks on behalf of the collaboration.

One of the most common ways that follow labs modify releases is by inserting or moving up quotations from their own faculty. For example, in one set of nine press releases concerning the October 10, 2013, release of results by the LUX collaboration described above, five follow-institution press releases rewrote the copy such that a quote from one of their own researchers was the first quote in the piece. Though this can be seen as a means of simply highlighting the work that their own researchers have done, there is something interesting about the way that the modification comes in terms of including direct quotes. Sourcing not only draws on the expertise of scientists; it also helps to produce it. For a press release to prominently quote a researcher is to certify that the researcher is a respected expert about the topic. In this way, institutions are able to better deploy press releases as means of gaining social capital related to employing notable public experts.

The release around the "inauguration" of the XENON1T instrument on November 11, 2015, at the INFN Gran Sasso Underground Laboratory provides a further example of how different organizations pull apart institutional press release to reform them in beneficial ways.

On the day of the inauguration, INFN Gran Sasso published a press release on their website. The press release begins as follows:

> There is five times more dark matter in the Universe than "normal" matter, the atoms and molecules that make up all we know. Yet, it is still unknown what this dominant dark component actually is.
>
> Today, an international collaboration of scientists inaugurated the new XENON1T instrument designed to search for dark matter with unprecedented sensitivity, at the INFN Gran Sasso Underground Laboratory in Italy. (The XENON Collaboration, 2015, paras. 1–2)

Over the next week, two members of the collaboration, Purdue and Columbia Universities, circulated the press release verbatim. The next day, however, Purdue posted a second, follow-up piece that folds selected content from the release content into a profile of Rafael Lang, a Purdue faculty member who was the analysis coordinator of the experiment (Gardner, 2015).

Another eight institutions distributed modified versions of the release. For example, the University of Chicago kept the lead, but dropped much of the detail in favor of direct quotes from Luca Grandi, a University of Chicago physicist who is part of the collaboration, and from Elaine Aprile, the collaboration spokesperson. Similarly, the Oscar Klein Centre not only introduced an entire section about their researchers, it included a picture of them along with a new diagram of how the experiment operates.

Ecole des Mines de Nantes linked to the original release, but introduced it with graph that reframed the experiment in this way:

> An international collaboration of scientists involving in particular the Laboratory for Subatomic Physics and associated technologies (Subatech, CNRS / Ecole des Mines de

> Nantes / University of Nantes) (1) inaugurated the Gran Sasso underground laboratory in Italy, the new XENON1T instrument. (Ecole des Mines de Nantes, 2015, para. 1)

Similarly, the University of Amsterdam released a version with the lead:

> An international collaboration of scientists, with UvA professor Patrick Decowski and his team, inaugurated the new XENON1T experiment in the underground Gran Sasso laboratory in Italy. (The University of Amsterdam, 2015, para. 1)

A few days later, the University of Zurich entirely rewrote the release to focus on how "UZH Physics Professor Laura Baudis and her team played a significant role in the development and construction of this detector" (Serck-Hanssen, 2015, para. 1).

Ultimately, it is in a collaboration's best interest to tap into the diverse distribution networks of members. However, member organizations have little incentive to distribute releases that do not explicitly support their researchers. As a result, collaborations permit member institutions to rework carefully written and reviewed press releases to gain their help in distributing releases. As seen above, in rewriting releases, communication offices pull sentences, quotes, ideas, frames from releases, and then attempt to recontextualize them in ways that they believe will better support their own organizational interests. Although this may be the case, in doing so, each institution helps to distort information flows about science.

Financial Pressure, Aggreduction, and Deformation

The final translational moment considered here concerns the production of news articles about direct detection experiments. In particular, this example looks at aggregation practices within science journalism and demonstrates that in response to economic pressures, some news organizations are choosing to exclusively rewrite and rework existing content rather than pursuing original reporting.

Despite more recent attention (Coddington, 2019) aggregation in journalism has often been marginal concern in journalism studies (Lee & Chyi, 2015 p. 4). As a result, there remains no consensus definition of news aggregation. Isbell (2010) offers a minimal definition as "a website that takes information from multiple sources and displays it in a single place" (p. 2), a definition that Lee and Chyi (2015, p. 5) echo. Others have described aggregation as also including the consolidation of pieces of articles into a single text (Anderson, 2013; Coddington, 2015).

This article reserves the term aggregation for the act of collocating different articles or links onto a single website as aggregation. It also introduces the term "aggreduction," a portmanteau of aggregation and production, as the act of rewriting and/or synthetizing bit and pieces of existing texts to produce new seeming content. Potentially involving a range of content, aggreduction serves as a broader category for phenomena such as "churnalism," which usually refers to the quick rewriting of press releases (Davies, 2009). Importantly, aggregation and aggreduction are news practices that have arisen largely in response to economic pressures. As news outlets struggle to find successful financial models, many are cutting back on staff and resources. In many organizations, remaining journalists are required to cover wide beats,

produce multiple articles each day, and hit traffic targets, all with minimal support and few resources (Brennen et al., 2020). Simply republishing or rewriting existing articles serves as a quick way for journalists to meet these expectations with somewhat reliable content.

Yet aggreducers facilitate and traffic in deformation. They actively pull apart the information flows they encounter to generate the shards and fragments they repurpose. Looking at aggreduction occurring within news coverage of direct detection of dark matter provides a more detailed view of the ways that specific news practices can deform information flows. Here, journalists from three respected digital-native science outlets rewrite articles by repurposing leads, metaphors, explanations, and source quotes. For example, this is the leads from an ABC News story (itself adapted from an AP story):

> Far below the Black Hills of South Dakota, crews are building the world's deepest underground science lab at a depth equivalent to more than six Empire State buildings—a place uniquely suited to scientists' quest for mysterious particles known as dark matter. (Lammers, 2009, para. 1)

This is RedOrbit's lead:

> The world's deepest underground science lab is being built below the Black Hills of South Dakota. With a depth equal to more than six Empire State buildings, the space is perfectly tailored to the needs of scientists in their quest for mysterious particles known as dark matter. (Savage, 2009, paras. 1-2)

Here, RedOrbit picks up and shuffles around phrases and images from the ABC News story. Indeed, here, the latter article is so similar to the first, that it largely preserves its meaning. This is not always the case. One article about the XENON1T collaboration in Nature states,

> Either way, within a few weeks of switching on, the new detector could in principle detect dark matter at any moment. The longer it goes without doing so, however, the lower the limits it will impose on the strength of WIMP interaction with normal matter. (Cartlidge, 2015, para. 7)

When an author from Futurism rewrote this article, this graph became simply, "It is hoped that the new detector will find dark matter after just a few weeks of operation" (Libunao, 2015, para. 3). There is an important difference between "in principle" and "it is hoped." The Futurism piece not only makes it sound more likely that the detector would find dark matter, but it further ignores the actual contribution that the detector will make in helping to provide a new limit on WIMPs mass/cross section.

Aggreducers in this case also regularly fail to identify source quotes as deriving from press releases—in a sense obscuring their origins and contexts of production (e.g., Santos, 2015). In other cases, articles turn press releases into quotations. One Universe Today article lifts three paragraphs from a press release from Lawrence Berkeley National Laboratory, which it quotes from the collaboration as said "in a statement" (Howell, 2013). A RedOrbit article reprints whole sentences from a BBC article, and then cites

them as "according to BBC Science reporter Paul Rincon" (Savage, 2010, para. 2). Interestingly, the article then lifts and cites two graphs from the CDMS-II website. Journalists have long held a significant distinction between content provided in an in-person interview, and that which derives from written sources (Ettema & Glasser, 1984). In altering the context of source quotations, these articles do much to unsettle the epistemological underpinnings of these stories.

The three translations within the public communication of direct detection of dark matter research described here highlight the range of actors and forces that can contribute to the processes of deformation. Within the sociotechnical networks that define the public communication efforts of these collaborations, technical affordance, lack of coordination, news practices, institutional self-interest, and economic incentives are some of the forces at play. But the point is not to catalogue the forces that catalyze deformation, but rather to demonstrate that as information moves in time and over space it is constantly undergoing mediations and translations. In this case, many different actors, from scientists, to communication specialists, to journalists, all actively work to pull apart information flows and construct something new (seeming). Each actor shown here does so for their own unique reasons, and each is pursuing a unique set of meanings. Taken together, these examples demonstrate that even absent intentional disinformation, deformation is more the rule than the exception, that we should consider all the work that is required to maintain the continuity of information flows over time and space.

The Deformation Society

Communication scholars have long made room for misinformation as errors and disinformation as intentional lies or fraud (Stahl, 2006). Indeed, communication was in part founded on early propaganda studies (Bernays, 1928; Lasswell, 1927). Today, scholars are recognizing that companies, politicians, think tanks, and even governments are building and adopting new tools, outlets, and strategies to circulate disinformation for (geo)political, financial, or ideological gain (Oreskes & Conway, 2010; Southwell et al., 2018). Yet this article has shown that we should recognize that various pressures and forces within our media and information systems can degrade and compromise information flows even before the production of intentional disinformation. Deformation—the grinding of disparate logics, systems, technologies, and messages that produce pieces and fragments of unordered information—is endemic in the contemporary media system, and arguably names a precondition for more commonly discussed information disorder.

There is always good reason to avoid adding yet another analytic, especially when the field is already so crowded: misinformation, disinformation, outformation, malformation, and now deformation. Yet, unlike those other terms, the concept of deformation offers a revision to how we fundamentally approach not only the threats to our information system but to the stability and continuity of all information as it flows. Deformation suggests that we move past simplistic treatments of information as a commodity whose continuity is never in question. It suggests that along with cultural, psychological, or economic imperatives, we consider the role that complicated dynamics and forces within media systems play in information disorders—that is to say it suggests that we attend to basic dynamics of information as much as those of misinformation.

Though critiques abound, the notion of an "the information society" persists. This article shows some of the danger in failing to problematize information itself—in failing to see that the integrity of

information cannot be assumed as it moves from place to place or persists in time. At the risk of overstatement, this article suggests that rather than the information society, ours is perhaps better described as a "deformation society."

This is not to suggest that deformation is a new phenomenon; there is reason to suspect that deformation has been a persistent dynamic of all media systems. What may have changed, however, is its prevalence. There are new forces and pressures at play that may be altering the speed and ubiquity of processes of deformation, including changing norms of self-promotion, new technological affordance, and challenges of coordinating larger and larger communicative networks—just as there are changing cultural norms about the value and potential of creative repurposing. One useful direction for future work would be to historically trace some of the forces of decomposition described here, to better understand what, precisely, has changed in terms of deformation over time.

Some have described the key struggle of the information society as to process, cull, or reduce information (Postman, 1993), but in the deformation society, the struggle is to produce information. It is for consumers and intermediaries to wield the agency to fashion together the bits and pieces in circulation into coherent structures that can lay claim to both truth and meaning. The deformation society gives bricolage or remix new urgency, not just as a creative endeavor but as an epistemological—maybe even ontological imperative (Markham, 2017). For Lash (2002), old news loses its use value, but deformation is as useful as what can be made with it.

But, importantly, not all rebuilding is equal. It can and does often go awry. Truth claims can be weak or strong, even as meanings undergo not only evolution but involution. Political commentary drags with conspiracy theories while entertainment sites collect and pose "fan theories." Both are efforts to generate meaning from disconnected fragments and pieces. For both, that meaning often quickly loses touch with whatever little grounding it once had.

Deformation asserts the social utility of even partial or broken flows. Some scholars have made similar arguments about disinformation. For Polletta and Callahan (2017), consumers of disinformation are less passive "dupes" than active participants in larger "deep stories" or a "political common sense" (p. 1; see also Hochschild, 2016). Here, stories are both "allusive" and social, enigmatic and participatory (p. 3). Rather than believing every falsehood, audiences "often interpret outrageous stories as evidence of a broader phenomenon" (p. 14). Put a little differently, people do work in fitting together bits and pieces of information "from diverse sources" (p. 2) into larger ongoing stories and narratives. For Polletta and Callahan, the power of fake news comes less from its overt persuasiveness and more from its utility in allowing audiences to participate in social storytelling.

At the same time, there might be a more complex relationship between deformation and misinformation. Savvy manipulators have become skilled at turning deformation into disinformation: to craft lies from the morass of circulating fragments. More studies are showing how pieces of mis/disinformation are less wholesale fabrications and more recontextualized bits and pieces (Garimella & Eckles, 2020) that combine half and part truths into whole lies. It may be that lying has become so easy because deformation permeates our media systems. Or perhaps, deformation has helped coproduce our esteem for creative reforming; it is the

cultural capital of remix (Gunkel, 2015) and of the entrepreneur (Boltanksi & Chiapello, 2005). But deformation bears witness to the dark side to remix: We can forgive lies as long as they are well done.

And yet, deformation does not necessarily preclude information. Information persists as a nostalgic once-was and an aspirational yet-to-be. The real work of the deformation age is to build meaning out of ruins. Amid the deformation that defines us, we are left to labor on behalf of once and future information.

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