

A WORLD IN FLUX: JOURNALISTIC CHANGE IN SCIENCE JOURNALISM

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by

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The undersigned, appointed by the dean of the Graduate School, have examined the  
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A WORLD IN FLUX: JOURNALISTIC CHANGE IN SCIENCE JOURNALISM

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# A WORLD IN FLUX: JOURNALISTIC CHANGE IN SCIENCE JOURNALISM

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## ABSTRACT

As modernity undergoes radical changes, a narrative of journalistic change has emerged in journalism research. One way that journalistic change has been conceptualized is in terms of a shift from a high modern to a liquid ethos (Deuze, 2005, 2017; Hallin, 1992). But this narrative does not always take into account that journalism is a multifaceted institution with many interfaces (Koljonen, 2013). The narrative also tends to be simplistic because it exaggerates the scope of change and does not take the various elements of the journalistic ethos into account. This research seeks to challenge the prevailing narrative of journalistic change by homing in on a niche area of journalism. It uses a qualitative textual analysis to explore journalistic change in science journalism, focusing on news reports (n=186) of Crispr, a revolutionary development in biology. News reports were analyzed through the lens of a multidimensional model of journalistic change that features five core journalistic elements: knowledge, audience, power, time, and ethics (Deuze, 2005; Carpentier, 2005; Hanitzsch, 2007; Koljonen, 2013). By exploring the nature of journalistic change in science journalism from 2013-2017, it is possible to further understand the current state of journalism. This study's suggestion that a high modern ethos prevails in science journalism contributes to scholarship concerning journalistic change and scholarship devoted to understanding the core elements of the journalistic ethos.

## Chapter 1: A World in Flux and Journalistic Change

Journalism has helped society make sense of modernity for a long time. Or as some have put it: journalism is modernity's primary sense-making practice (Hartley, 1996, 2000; see also Christians et al., 2010). But modernity is changing, and journalism is said to be exemplifying those changes (Bauman, 2000; Beck et al., 2003; Deuze, 2005; Giddens, 1990; Koljonen, 2013). In this sense, journalism both contributes to and reflects a world in flux.

As journalism simultaneously mirrors modernity's changes and remains engaged in sense-making, a narrative has emerged that conceptualizes journalistic change in terms of a shift from a "high modern" to a "liquid" journalistic ethos (Deuze, 2005; Hallin, 1992; Koljonen, 2013). The high modern ethos lasted from the 1930s to the 1980s (Hallin, 1992; Schudson, 1978). During this period journalists were seen — and they saw themselves — as people whose work was inherently good, largely because it was rooted in modernism's cornerstone institution: science. Much like science, journalism's primary function was to report observations about the world to the citizenry. The main goal in mind was a healthy democracy. Things were not always perfect. Questions about journalism's claim to objectivity always loomed, but as journalism's primary occupational and philosophical value, objectivity managed to survive, much like rituals outlast religious belief. Put another way, the paradigm was repaired whenever it was compromised, allowing for the public acceptance of journalism as society's primary gatekeeping institution.

But today it is said that journalism is increasingly *liquid* (Deuze, 2005; Jaakkola

et al., 2015; Koljonen, 2013). Liquid journalism is generally understood as the journalistic response to modernity's rapid changes. More specifically, liquid journalism refers to changes in journalism's physical landscape, such as journalism's shift from a static offline platform to one that is fluid and online. It also refers to changes regarding journalism's guiding occupational and philosophical values, such as resurging skepticism toward objectivity and the rise of journalism that values audience participation, transparency, and advocacy (see e.g., Domingo et al., 2008; Hellmueller, Vos, Poepsel, 2013; Mindich, 2000; Waisbord, 2009). The changes in both journalism's physical landscape and its guiding philosophical and occupational values are what contribute to journalism's "liquidity."

Concepts such as *high modern* and *liquid* journalism are helpful in conceptualizing opposing approaches to journalistic practice. But the inherent features of the shift from a high modern to a liquid ethos become less clear in light of journalism's varied forms. There is journalism about art, business, and culture, as well as journalism about politics and religion. A key question guiding this research is how the shift toward a liquid ethos is impacting different forms of journalism (see e.g., Jaakkola, et al., 2015). This dissertation particularly focuses on how science journalism has absorbed liquid journalism. Science journalism is broadly defined within the context of this research as news about scientific developments and breakthroughs, the scientific process, and scientific goals and challenges (Angler, 2017). The focus will be on U.S. newspapers that are subject to the logic of institutional journalism — newspapers that generally value accountability, facts, and timeliness, and fairness, etc. (see e.g. Domingo et al., 2008). If traces of the high modern tradition remain throughout science journalism, which ones are

they? Why have they survived? How do the elements of journalistic liquidity shape science journalism? Most importantly, what do the answers to these questions say about the changes taking place in journalism?

Science journalism presents an interesting case because journalists are expected to meet a demand for the public understanding of science (Bubela et al., 2009; Dunwoody, 2014; Nelkin, 1995; Lewenstein, 1992; Scharrer et al., 2016). The demand is driven by a preference for science-based policy among the public and policymakers alike. Consequently, journalism has a tradition of acting as the conduit for scientific information to flow throughout society (see e.g., Lewenstein, 1992). Second, this approach is an opportunity to build on research suggesting that characteristics specific to the practice of communicating science to the public parallel the shift from a high modern to a liquid ethos (see e.g., Dearing, 1995; Irwin & Wynne, 1996; Fahy & Nisbet, 2011; Sturgis & Allum, 2004; Wynne, 1993). Third, changes in modernity have also affected perceptions about science — this development is exemplified in the question: Does science offer an objective interpretation of reality, or is science just another form of subjectivism reflecting the ideas of those in power? Finally, science itself has absorbed some of modernity's changes. For most of modernity, scientists saw the universe as deterministic, and it was believed that scientific endeavors consisted of “making a full inventory of its laws so that there [would] be no more groping in the dark and human action [would] be unerring and always on target” (Bauman, 2000, p. 136). But contemporary scientists are increasingly recognizing that the universe is not deterministic. The scientific community is developing new theories of chaos and catastrophe positing that chance plays a big role in creation, and that order and

equilibrium are exceptions to the rule (Bauman, 2000).

## **Crispr**

Modernity's fast-paced and radical changes have especially affected the molecular biology field and research into its most fundamental element: the gene. In molecular biology, the gene is as crucial as the atom is to physics and the byte is to computing (Humphries, 2016). Command over the gene allows scientists to further unlock the secrets of DNA. Consequently, it allows scientists to manipulate DNA more easily. And in 2012, molecular biologists at the University of California, Berkeley took a historic step toward gaining command of the gene. They harnessed an ancient bacterial system called Crispr–Cas9 (clustered regularly interspaced palindromic repeats) and described how to use it as a genome engineering tool (Doudna, 2015).

Japanese researchers first described Crispr in 1987 after they found the repeating DNA sequences in the genome of *E. coli*. Fifteen years later, in 2002, scientists discovered that Crisprs were part of *E. coli*'s immune system. It was ten years later in 2012 that researchers discovered how to use *E. coli*'s immune system as a genome-editing tool. Previously, molecular editing tools usually took years to become established, but as the fastest way to edit DNA, hundreds of labs throughout the world began using Crispr immediately after it was made public, ushering in a new and fast-paced phase in molecular biology and a wave of ethical concerns.

To summarize, the purpose of this dissertation is to develop a deeper understanding of the current journalistic ethos by investigating how changes in modernity and journalism are manifested throughout science journalism. I will carry out a

qualitative textual analysis of news coverage about Crispr — one of science's greatest developments in recent memory.

I begin by outlining the major premises of liquid modernity, the concept from which liquid journalism is derived (Bauman, 2000). Then I review the development of liquid journalism and in doing so I briefly give an account of high modern journalism. In the following section I review trends in science journalism and the broader field of science communication. This part of the review calls attention to features in science communication that parallel journalism's supposed shift from a high modern to a liquid ethos. Next, I offer a framework that elaborates on the shift from a high modern to a liquid ethos by focusing on the way journalism works in relation to five categories that determine journalistic change: knowledge, audience, power, time, and ethics (Koljonen, 2013). After establishing the framework, I establish the research questions and follow them up with a methods section explaining the logic behind qualitative textual analysis. Then I discuss the findings. Finally, I conclude by discussing how the findings speak to the current journalistic ethos.

## Chapter 2: Literature Review

### Liquid Modernity

The shift from a high modern to a liquid journalistic ethos is best understood in view of macro-level societal changes. Serious attempts at homing in on the nature of those changes have conceptualized them as liquid modernity, high modernity, postmodernism, reflexive modernization, the totalization of capitalism, or the latest stage of the secular age (see e.g. Bauman, 2000; Giddens, 1990; Hicks, 2004; Jameson, 1991; Meiskins Wood, 1996; Taylor, 2007). The common denominator throughout these conceptualizations is that the “fast-paced and radical change” taking place today is a departure from a traditional way of doing things. The focus here will be on the concept of liquid modernity for two reasons. First, despite considerable overlap with the aforementioned conceptualizations, liquid modernity does not have explicit normative assumptions attached to it. For example, people described as *postmodern* usually do not choose that label for themselves. It is a label assigned to them by people who claim that postmodernism is a threat to the values of Western culture. Likewise, the conceptualization of the modern era as the totalization of capitalism requires accepting that capitalism is a bad economic and political system — in this approach the *totalization* is not seen as a good thing. The second reason liquid modernity will be the main focus is that scholars have laid some of the groundwork for understanding journalistic change through the lens of liquid modernity (see e.g. Deuze, 2008).

Polish sociologist and philosopher Zygmunt Bauman coined the concept of liquid modernity (Bauman, 2000). Bauman’s project was primarily to address the changes of

contemporary society, but it was also a challenge to the idea that we live in *postmodernity*. According to Bauman, we still inhabit the modern world. He invokes this view in the opening quote to his book, *Liquid Modernity*:

Interruption, incoherence, surprise are the ordinary conditions of our life. They have even become real needs for many people, whose minds are no longer fed by anything but sudden changes and constantly renewed stimuli. We can no longer bear anything that lasts. We no longer know how to make boredom bear fruit. So the whole question comes down to this: can the human mind master what the human mind has made? (Paul Valery in Bauman, 2000).

The quote is from the early to mid 20<sup>th</sup> century, but clearly it reads like contemporary commentary. For Bauman, modernity exists on a continuum. The difference is that today modernity is no longer made up of “solid” concepts and institutions. Rather, modernity is increasingly “liquid.” He addresses the metaphor in great detail at the beginning of *Liquid Modernity*. Unlike the molecules in solids, whose atoms are bound, molecules in liquids undergo continuous change when they are subjected to stress. A key difference between solids and liquids is their relation to space and time. Solids are primarily defined by their shape, which neutralizes the impact of time, whereas fluids are primarily defined by time because they do not keep the same shape for very long. Solids are stable and heavy; fluids are mobile and light (Bauman, 2000).

The radical change taking place in society is that the “long effort to accelerate the speed of movement has presently reached its ‘natural limit’” (p. 10). Bauman illustrates how this natural limit has been reached by using emancipation, individuality, time/space, work, and community as conceptual case studies. These case studies also show how

accelerating the speed of movement to its natural limit affects different elements of society. Concerning power relations, the shift to instantaneity means that being settled and sedentary is no longer superior to being mobile. Bauman adds: “We are witnessing the revenge of nomadism over the principle of territoriality and settlement. In the fluid state of modernity, the settled majority is ruled by the nomadic and exterritorial elite” (p. 13). Socially, there is fragmentation, but social fragmentation both creates and reflects “the new technique of power,” namely because tight social bonds are obstacles to global powers whose primary source of strength is fluidity (p. 14). Bauman invokes sociologist Ulrich Beck’s (2002) notion of “zombie categories,” as well as Beck’s reflections on the family to illustrate social fragmentation (see also Blackshaw & Crawford, 2009). The family is a zombie category because it is dead and alive. There are still grandparents, parents, and children, etc., but divorce trends have fragmented the core of the family (Bauman, 2000). Regarding economics, “it is the mind-boggling speed of circulation, of recycling, aging, dumping and replacement which brings profit today — not the durability and lasting reliability of the product” (p. 14). From a philosophical and ethical standpoint, in fluid modernity the patterns, codes, and rules that were once selected as “stable orientation points” are in short supply.

Oxford Dictionaries’ designation of “post-truth” as the 2016 word of the year corroborates Bauman’s thinking. *Post-truth* is “an adjective defined as ‘relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief’” (Oxford Dictionary, 2016). Although *post-truth* was popularized in the context of the unusual 2016 presidential campaigns, the word calls attention to developments outside the political realm. Post-

truth has increasingly been used to describe society at large, not just a circumstance here and a circumstance there. In this sense, the concept is synonymous with an increasing erosion of trust toward institutions and traditional concepts. A convenient example is the increasing distrust toward science as an objective source of truth (see e.g. Sokal & Bricmont, 1999). The distrust comes from both sides of the ideological spectrum. For instance, progressive sectors of American society reject the science that says genetically modified foods are harmless, whereas conservative sectors reject the science that says climate change poses serious and immediate threat to humanity (see e.g. McCright & Dunlap, 2011; Thacker, 2017).

But Bauman suggests individuals still rely on some of society's older categories — the ideal-typical values of liquid modernity have not become the status quo, so society does not have to reinvent the wheel on a daily basis. Yet, old categories *are* increasingly subject to universal comparison, which leaves efforts to self-construct new customs, categories and institutions etc. perpetually underdetermined. Hence, Bauman alludes to the opening quote by suggesting that presently we have a large number of zombie categories, and the “practical question is whether their resurrection, albeit, in a new shape or incarnations, is feasible; or — if it is not — how to arrange for their decent and effective burial” (p. 8). Today, journalism faces a similar question concerning the categories that have long shaped the philosophical and occupational elements of its ethos (see e.g. Tong, 2018,

### **Liquid Journalism**

Journalism has always had elements of liquidity insofar as journalism is an evolving institution. Furthermore, at different times throughout the twentieth century

scholars alluded to an impending shift toward a liquid journalistic ethos. Throughout these allusions, political, cultural, economic and technological phenomena were regarded as the impetus for journalistic change.

In the late 1970s, one of the first intimations of journalistic liquidity was attributed to changes that happened in the sixties, namely the government's increasing management of the news and the rise of an adversary culture that raised questions about the merits and possibility of achieving objectivity (Schudson, 1978). Government's increased involvement in news management refers to the process by which the publicity of political deliberation itself became a political issue. Although the expansion of government public relations had begun in the 1920s and 1930s, in the 1950s and 1960s — during the emergence of television — the main concern was the executive branch's increasing use of “pseudo-events” to successfully represent itself in a positive light (Boorstin, 1962; Schudson, 1978). Under these conditions, simply reporting the facts was not sufficient because events were no longer spontaneous and random. Rather, those in society who held the most power were the ones constructing newsworthy events, leading journalists to become increasingly aware that their work was, if not lying, “at least cooperating in not telling the truth to serve the national interest” (Schudson, 1978, p. 172).

Concerning the adversary culture, after World War II an influx in higher education enrollment gave an abnormally high number of people “a vantage point from which to judge and condemn, perhaps even revise, the culture that produced [them]” (Trilling, 1965, p. xii-xiii). This vantage point coincided with the political and civil unrest that marked the sixties (see e.g. Steiger & Flamm, 2007). The broader cultural and

political currents affected the cohort of journalists that came of age during this period, these currents shaped their journalism, and in turn, an older generation of editors and publishers was also influenced (Schudson, 1978). The main impact these currents had on journalism was that they conjured critiques of objectivity from various angles. The main critique can be summarized as follows: News story content is driven by implicit assumptions about the world, and these implicit assumptions are themselves a kind of bias that is enforced by standard newsgathering practices (Schudson, 1978). Objectivity, then, came to be viewed as the most insidious bias of all — merely a strategic ritual whose sole purpose was to protect publishers’ careers and powerful institutions (see e.g. Schudson, 1978; Tuchman, 1978). Yet, in the sixties and seventies there was not a wholesale overthrow of objectivity, which led to the observation that “if a shift in the ideas of journalism occurs, it will have submerged traditions to support it,” and that “some rituals and routines of occupational practice will be defended in an overarching ideology” (Schudson, 1978, p. 186-187). This observation predicted that today’s journalistic changes would not be radically different from the distrust toward objectivity that peaked in the sixties and seventies. Furthermore, it predicted that in the face of change, journalistic routines and practices rooted in the notion of objectivity would be hard to overthrow.

In the 1990s, another intimation of liquid journalism was placed squarely against high modern journalism (Hallin, 1992). The argument was that the political and economic trends that began after WWII created an environment suitable for high modern journalism. On the domestic front, liberal policies from the New Deal led to political consensus, and in foreign policy matters, the Cold War ensured bipartisanship in the form

of containment policies. Regarding economic security, from the 1960s to the 1980s television had a privileged place because of the secure profitability of the networks and because the broadcasting industry was regulated. This political and economic context prompted journalists to accept “the bureaucratic hierarchy of the newsroom and the constraints of the professional norms of neutrality and ‘objectivity’” (Hallin, 1992, p. 15). Furthermore, during this time period journalists believed they were able to be part of the establishment without surrendering independence, that is, it made it possible for them to accept the “profane” commercialization side of news without sacrificing the “sacred” public service side (Hallin, 1993, p. 21). A final key characteristic of high modern journalism was that the audience was perceived as passive and universal with equal access to similar news about main events. However, in the 1990s high modern journalism started to dissolve because the market forces began blurring the lines between the business of selling the audience to advertisers and the practice of journalism, the political consensus broke down, and audience fragmentation was just around the corner with the rapid increase of public and commercial use of the Internet.

Although the concept of liquid journalism is not mentioned in these accounts, two observations can be made in retrospect. It can be said that characteristics of liquid journalism emerged in the face of 1960s critical culture, the popularity of TV, and the government’s increasing skill at news management. It was also implied that journalism would take on liquid characteristics in the face of consensus dissolution following the Cold War, the increasing pressure of market forces, and the audience’s looming fragmentation. Accordingly, these analyses served as a platform for contemporary

scholarship devoted to understanding journalistic change. It is also in contemporary scholarship where the first pronouncements of liquid journalism are found.

The idea that journalism has liquid-like characteristics was introduced in 2005 as a direct appeal to Bauman's thesis about the change from a stable to a liquid modernity. The idea appeared under the banner of "liquid modern news times" and was used in a discussion seeking to operationalize journalism's occupational ideology. In that context occupational ideology was defined as a "system of beliefs characteristic of a particular group, including — but not limited to — the general process of the production of meanings and ideas" (Deuze, 2005, p. 445). Throughout this account, multimedia and multiculturalism were taken as conceptual case studies in order to show how both trends relate to journalistic change. Part of the conclusion from this operationalization was that traditional binary oppositions such as those between mainstream and alternative news media, between serious and popular, and between hard and soft are "increasingly untenable in our liquid modern news times" (Deuze, 2005, p. 458).

Three years later *liquid journalism* was articulated in a feature essay whose thesis echoes the observation from earlier decades: shifts in journalistic change will be rooted in older traditions, and an overarching ideology will be used in defense of existing rituals and routines (Schudson, 1978). The 2008 thesis can be summarized as follows: fundamental changes in society have spurred changes in journalism, but journalism's traditional occupational values — such as objectivity — have impeded journalism from becoming *liquid journalism* (Deuze, 2008). In this thesis, the fundamental changes in society are described in the context of monitorial citizenship (Schudson, 1999). Monitorial citizenship refers to citizens' tendency to engage in the political process on

their own terms, much like individuals' consumption practices are increasingly customized experiences (Deuze, 2008). The "citizen-consumer" culture, along with the Internet and the outburst of new technologies are credited for changing the lived realities of those involved in the journalistic process and the lived realities of the audiences that journalism is meant to serve. Indeed, by the 2000s the audience fragmentation forecasted in the 1990s came to fruition, and one of the more notable changes was the public's increasing ability to be in charge of their news consumption (Deuze, 2008). The implication was that the public could increasingly question journalism's core values and morality. Meanwhile, journalism was still depending "on its established mode of production, through which it largely reproduce[d] the institutional contours of high modernism" (Deuze, 2008, p. 856).

In the 2010s the steady stream of new technologies, organizational restructuring, increasing audience fragmentation, and journalists' reformulation of normative ideals has become more widely recognized. But empirical research that conceptualizes the shift in terms of liquid journalism remains scant and has predominantly taken place in Europe. For instance, in a study examining the rise of liquid journalism among Finnish political journalists, it was found that they have adopted a faster pace, flexible teamwork, and opinionated assertiveness — all practices that were categorized as liquid (Kantola, 2012). Furthermore, solid moderns, liquefying moderns, and liquid moderns emerged as three journalistic groups roughly divided by age and that accept journalistic change in varying degrees (Kantola, 2012). Research has also focused on developing appropriate methods for researching liquid journalism. One study used major online newspapers from Britain and Sweden in order to test a strategy for "freezing the flow of online news" (Karlsson, &

Stromback, 2010). The main goal in this research was to develop a three-part strategy that enables content analyses of interactivity and immediacy, two key values of online news that contribute to journalism's liquidity (Karlsson & Stromback, 2010). Another study focused exclusively on the online news flow of Swedish Public Service Radio and sought to offer methodological guidelines on how to research the liquid nature of online news by using time, duration, and the position of material as its central variables (Widholm, 2016). Though limited, this body of research suggests that the only certainty in journalism is uncertainty and that journalists, news seeking, information, and audiences all involve a heightened sense of contingency (Kantola, 2012; see also Karlsson, & Stromback, 2010). Journalism, then, is facing new realities. And in some ways, these new realities have reverberated throughout journalism devoted exclusively to science.

### **Science Journalism**

According to its Latin etymology science means "knowledge." Out of the range of disciplines people draw from to make sense of the world, science is often revered as mankind's most fruitful for understanding and for giving hope. Reverence for science grew with the onset of modernity, which overthrew traditional ways of knowing and institutionalized science as the chief purveyor of rational thought and as the primary source of legitimate authority (Jarvie, 1990). Hence, throughout U.S. history different platforms have been used to communicate science to the public. In the nineteenth and early twentieth centuries science was communicated through lectures given at Lyceums and Chautauquas, which were part of broader ideological movements that aimed to improve the public's education and the nation's democracy (see e.g. Lewenstein, 1992). In both cases booming print industries coincided with these movements. At the turn of

the century popular science magazines such as *Scientific American* and *Popular Science Monthly* were well-established and newspapers routinely disseminated knowledge about science by reprinting texts from science lectures (Burnham, 1987). Up to that point, the scientist was readily accessible to the public. The accessibility, however, ended in the early twentieth century when institutions' turn to professionalization and specialization led scientists to retreat from the public square, leaving the communication of science almost exclusively in the hands of journalists (Burnham, 1987).

But it was not until the 1930s that science journalism itself was institutionalized. In the 1930s revelations about World War I atrocities and dire economics inevitably raised questions about science and its responsibility to society, thus turning "science and society" into a catchphrase in the dialogue among scientists and their exchanges with the public. The scientific community naturally responded by leaning on various media to develop their dialogue, which started a science-centric period (Russell, 1993). A popular scientist of that era, Lancelot Hogben, captured the decade's conventional attitude when he noted that the importance of constructing the world of science was "not its externality but its communicability" (Russell, 1993, p. 50). Commercial publishers, scientific organizations, science writers, and government agencies all responded to the post-war demand for science communication, and the science-centrism of the 1930s eventually matured into a "moral certainty about the social importance and efficacy of science" (Lewenstein, 1992, p. 48). After taking up science reporting full-time, a dozen journalists created the National Association of Science Writers (NASW) in 1934. The onset of World War II and the threats of atomic science went on to ensure the presence of science in mainstream journalism (Gregory & Miller, 1998), and the NASW was eventually

incorporated in 1955 with a charter to “foster the dissemination of accurate information regarding science through all media normally devoted to informing the public” (National Association of Science Writers, 2011, para. 2). Today it continues to advocate for “the free flow of science news” (National Association of Science Writers, 2011, para. 4).

Since its institutionalization, science journalism has been influenced by broader journalistic changes (Dearing, 1995). Most recently, economic pressures, questions about the merits of objectivity, and widespread use of the Internet have had the greatest impact on science journalism. Plummeting newspaper circulation, decreasing advertising revenue, and media consolidation have led to less staff devoted exclusively to science topics (Zara, 2013). The lack of resources devoted exclusively to the science beat has contributed to a preference for novel and episodic stories focused solely on current developments in biotechnology and biomedicine—these disciplines, arguably more than others, regularly feature breakthroughs and discoveries (Dunwoody, 2014; Einsiedel, 1992; Nelkin, 1995; Pellechia, 1997; Racine et al., 2010; Sumner et al., 2014). Focusing on episodic and novel news items has influenced a turn to sensationalism, best described as a tendency for reports to focus primarily on the “fastest or the slowest, the hottest or the coldest, the biggest or the smallest, and in any case, the newest thing in the world” (Nelkin, 1995, p. 1). In the past, the objectivity norm may have helped temper incompleteness, unbalance, or sensationalism. But changing perceptions and implementations of objectivity have also influenced the science beat.

Implementing objectivity as balance has been characteristic of science journalism. When science journalists encounter conflicting claims, their coverage focuses on representing claims accurately rather than investigating the validity of the claims

(Dunwoody, 2014). With the objectivity-as-balance approach, science journalism presents views that are at odds with the scientific establishment alongside views from the scientific establishment itself. In some instances, balance may also be achieved by presenting as many views as possible (Dearing, 1995; Dixon & Clarke, 2012; Griffin & Dunwoody, 1997). But implementing objectivity as balance has been critiqued for leading to erroneous reporting in at least two ways. First, by virtue of presenting many or opposing views, journalists may conclude their reporting is thorough and therefore neglect fact-checking their sources (Boykoff & Boykoff, 2004; Dixon & Clarke, 2012). Most importantly, however, there is the well-known problem where presenting opposing views may make it seem like there is conflict within the scientific community when in reality most of the science is in agreement (Corbett & Durfee, 2004; Dixon & Clarke, 2012).

A preference for advocacy over objectivity has also emerged (Neuzil, 2008; Schwartz, 2006; Wyss, 2008). But in studies seeking to understand how science journalists perceive their work, journalists often express the need to remain objective. Yet, in these studies journalists rely on their own understanding of objectivity and some favor working with community leaders and “advocacy reporting” (Saschman et al., 2006, p.112). While science journalism is still expected to carry out traditional reporting and uphold the objectivity standard, some have also suggested that due to current changes, science journalism will increasingly involve journalists who cast into a plurality of roles that do not necessarily make objectivity a primary concern. These roles include public intellectuals, civic educators, agenda-setters, curators and conveners (Fahy & Nisbet, 2011).

The main element driving changes in science journalism is the Internet. The Internet has especially affected the relationship between journalists, scientists, and lay audiences. Internet-induced changes in science journalism are best illustrated through the knowledge deficit and dialogue models of science communication. The deficit model assumes that there is a substantial gap between scientific experts and the audience, and that it is the journalists' duty to fill the gap. In contrast, the dialogue model suggests that audiences and scientists have shifted from mere spectators to participants, and that journalists have a collaborative relationship with expert sources and their audience (Buchhi & Trench, 2014; Einseidel, 2014; Fahy & Nisbet, 2011).

For most of the twentieth century, the underlying assumption was that science could solve society's problems and that problems in the relationship between science and society stemmed from a lack of scientific understanding among lay people. These assumptions were eventually canonized as the knowledge deficit model of science communication (Bubela & Nisbet et al., 2009; Nelkin, 1987; Simis & Madden et al., 2016; Sturgis & Allum, 2004). The model's logic is that scientific innovation increasingly shapes modern society, and if the public becomes more literate about scientific matters, it will be more likely to approve of scientific innovation and science-friendly policies (Brossard & Lewenstein, 2009; Sturgis & Allum, 2004). This logic continues to appeal to scientists and policymakers who advocate for the popularization of science as a means to overcome the scientific illiteracy among lay people. And the popularization, of course, is largely viewed as the responsibility of journalists.

Despite this model's logical appeal, however, the decades-long effort to *sell* science to the public as the most suitable institution for propelling humanity forward has

not worked out as successfully as initially planned — science literacy among the public from the middle of the twentieth century onward has been consistently low (Miller, 1993, 1998, 2004; Nelkin, 1995; see also Sturgis & Allum, 2004). Additionally, as the twentieth century came to a close there was increasing skepticism toward the notion that science and progress go hand in hand. This skepticism was not entirely new. For instance, the atrocities of both World Wars and the subsequent threat of thermonuclear warfare during the Cold War had raised serious doubts about the merits of science. But toward the closing of the century the prospect of genetically modified foods, questions about the benefits of modern medicine, and the ethical dilemmas kick-started by stem cell research all contributed to a reemerging sense that science was not a sure-fire way to progress. In some ways, the reemergence of skepticism toward science rekindled support for the deficit model because the public's skepticism toward science was thought to stem from ignorance about the science involved in the developments it fears. However, by the 1990s critiques of the deficit model were well established. Scholars started arguing that different *contexts* were what led to “different judgments about what information was needed, by whom, and for what purpose” (Lewenstein, 2001, p. 441; see also Wynne, 1993; Irwin & Wynne, 1996).

Later on, it also became widely recognized that the Internet granted audiences the power to have more control over the information they consume and that journalists can now engage directly and transparently with different audiences (Allan, 2011). These critiques play a key role in the “public engagement,” “interactive science,” “lay expertise,” “reflexive,” and “contextual,” models of science communication (Bucchi & Trench, 2014; Einsiedel, 2000; Hamlett, 2002; Krinsky & Plough, 1988; Irwin & Wynn,

1996; Sturgis & Allum, 2004; Wynne, 1993). These models are best summarized as the dialogue model of science communication. Within them, scientific knowledge is viewed “not as an abstract canon of ‘facts’ but as sets of understandings within varying practical and social contexts. The effect of one form of understanding on attitude, will, in this view, be contextualized by other areas of knowledge” (Sturgis & Allum, 2004, p. 69). Additionally, skepticism among the public is attributed to differing worldviews that can shape how the public perceives risks and benefits, not scientific illiteracy. If the science aligns with one’s lived experience and beliefs, the scientific knowledge will be absorbed. Concerning the divide between spectator and participant audiences, the dialogue model allows for a new reality where audiences can implement their own information seeking practices (Dunwoody, 2014). At the practical level, the normative call is for journalists to bolster their situational awareness, consider both the audience’s context and feedback, then craft messages in a manner that will increase the likelihood of reception.

In brief, science communication and — by default — science journalism, have absorbed some of journalism’s liquidity. As one scholar has noted:

Left behind is the assumption that simply informing the public of the facts of science will meaningfully alter the perceptions of either policymakers or citizens. Instead, one can detect a growing recognition that communication is not simply a translation of facts but more importantly a negotiation of meaning (Nisbet, 2009, p. 41).

Thus far, however, journalistic change has primarily been discussed in terms of an opposition between objectivity and subjectivity, an opposition between a passive audience and an active audience, and an opposition between online and offline platforms.

And conceptualizing the shift in this way has been found to “simplify our understanding of the nature of this change and the complex and contradictory nature of the core issues that are at stake” (Koljonen, 2013 p. 142). Hence the emergence of an analytic framework that elaborates on the shift from a high modern to a liquid ethos (Koljonen, 2013). The framework synthesizes various models seeking to map the key elements of the journalistic ethos (Deuze, 2005; Carpentier, 2005; Hanitzsch, 2007; Koljonen, 2013). The following sections will discuss the main features of each model and review a framework of journalistic change.

### **Elements of the Journalistic Ethos**

There are three models that aim to outline the prevailing elements of the journalistic ethos. The commonality between the models is that they seek to bridge the gap between theory and empirical research. Throughout these approaches the journalistic ethos is referred to as the culture of news production, the identity of the media professional, the ideology of journalists, and the professional ethos of journalists. The key characteristics of the journalistic ethos are regarded as ideal-typical values, constituents and principal dimensions of journalism culture, and nodal points in the identity of the media professional.

**Table 1.** Models of the Core Issues in Journalism

<b>Deuze: Ideal-typical values of the occupational ideology of journalism</b>	<b>Hanitzsch: Constituents and principal dimensions of journalism culture</b>	<b>Carpentier: Nodal points in the identity of the media professional</b>
<b>Knowledge:</b> Objectivity	<b>Knowledge:</b> Objectivity versus subjectivity Knowledge: Empiricism versus analysis	<b>Knowledge:</b> Objectivity versus subjectivity
<b>Audience:</b> Public service	<b>Audience:</b> Citizen orientation versus consumer orientation	<b>Audience:</b> Professional elite versus representative of public Audience: Control versus partnership
<b>Power:</b> Editorial autonomy	<b>Power:</b> Loyalty to hegemony versus counter-hegemony Power: Active intervention versus passive neutrality	<b>Power:</b> Independence versus dependency
<b>Time:</b> Immediacy	<b>Time:</b> No core material to Hanitzsch	<b>Time:</b> No core material to Carpentier
<b>Ethics:</b> Ethicality	<b>Ethics:</b> Relativity versus universality Ethics: Idealism-minded versus strategic-minded	<b>Ethics:</b> No core material to Carpentier

*Note.* Adapted from Koljonen, K. (2013). The shift from high to liquid ideals: making sense of journalism and its change through a multidimensional model. *NORDICOM Review: Nordic Research on Media and Communication*, 34, 143.

One approach for understanding the prevailing journalistic ethos draws from post-structuralist and post-Marxist frameworks suggesting that diversity of discourses and “subject positions” are what determine identities (Carpentier, 2005). The framework is widely recognized for its guarantee to the “possibility of human subjectivity, agency, and individuality” (Carpentier, 2005, p. 200). But it constantly runs into the issue of change

vis-à-vis stability. In the context of finding journalism's ethos, the key is to draw out four "nodal points" from the "discursive field" shaping journalists' identity. In this approach, the nodal points become the cement that shape journalists' identity and practice. As such they become all-consuming to the point that they end up being viewed as absolutes and the necessary condition for further developments—they become hegemonic.

In this approach the hegemonic nodal points and the "counter-hegemonic critiques" that shape journalists' identity are as follows: 1) The semi-professional link to a media organization, best understood in terms of whether journalists view themselves as professional elites who are part of a private organization, or whether they view themselves as operating in partnership with the public and thus, acting as the public's representatives. 2) Responsibility and property management, which refers to how journalists view themselves: as the managers of resources or as sharing resources. 3) The autonomy and independence nodal points refer to the degree to which journalists practice free expression. 4) And finally, objectivity as a nodal point refers to journalists' adherence to the cornerstone of journalism's occupational ideology. The counter-critique, of course, is adherence to the notion that journalism should not be objective. In practice, pinning down professional identity is never a completed task because the way identity is practiced does not always stay within the well-defined discursive field/nodal points. Rather, professional identities become messier. But at the same time, it is evident that there are mainstay characteristics—the nodal points—that ultimately structure the identities (Carpentier, 2005).

Another approach has been to operationalize the ideal-typical values of journalism's occupational ideology (Deuze, 2005). As noted above, this particular

operationalization was carried out in view of the rise in multiculturalism and multimedia. Conceptualizing the journalistic ethos as an occupational ideology means understanding journalism in terms of how journalists give meaning to their work. Furthermore, ideology is seen as an intellectual process through which the sum of ideas and views of journalists are shaped, and also the process by which journalists exclude other ideas and views. Ultimately, the function of journalistic ideology helps determine what constitutes journalism, and who is a journalist.

The ideal-typical values that shape journalistic ideology, and the challenges that multiculturalism and multimedia pose are as follows: 1) Public service, which refers to journalists' role as watchdogs and active collectors and disseminators of information. Understood in the context of multiculturalism and multimedia, public service is said to shift subtly in the "consensual notion of serving the public, as it moves from a primary top-down meaning to an increasingly bottom-up application" (Deuze, 2005, p. 455). 2) Objectivity refers to journalists' commitment to remaining impartial, neutral, fair, and thus credible. With multiculturalism and multimedia in mind, objectivity is increasingly seen as standing in stark contrast to narratives of inclusivity. 3) Autonomy refers to journalists' independence, which is increasingly challenged by multiculturalism and multimedia as journalists are more likely to work in teams and are required to engage with minorities. 4) Immediacy refers to how journalists relate to time, with preference given to actuality and speed. But multimedia and multicultural pressures reject the "right here, right now" approach on the basis that it leaves out depth and complexity. 5) And finally, ethics. Journalists must adhere to an ethical code for validity and legitimacy (Deuze, 2005; Golding & Elliott, 1979; Kovach & Rosenstiel, 2001; Merritt, 1995).

The key characteristics of journalism's ethos have also been outlined as part of a theoretical framework designed for comparative analyses of different journalism cultures (Hanitzsch, 2007). This approach uses a deductive and etic approach to deconstruct journalism culture in terms of three key characteristics that are further divided into a total of seven dimensions. According to this approach, the three essential characteristics of journalism are institutional roles, epistemologies, and ethical ideologies. The dimensions that belong to institutional roles are 1) interventionism: the extent to which journalists are willing to pursue and promote particular values, 2) power distance: journalists' position in relation to society's power holders, and 3) market orientation: the degree to which journalism operates according to the goals and logic of the market. The dimensions belonging to epistemologies are 1) objectivism, which is divided between the assumption that there is a correspondence between what is said and what exists, and the view that all news is inherently subjective, and 2) empiricism, which has to do with how journalists justify their claims. Justifications are based on observation, measurements, evidence, and experience, or ideas, values, opinion, and analysis. Finally, the dimensions belonging to ethical ideologies are 1) relativism: the extent to which ethics are based on universal moral rules, and 2) idealism, which refers to whether journalists take a deontological or consequentialist approach to their ethics.

### **A Framework of Journalistic Change**

The framework of journalistic change that will guide this project synthesizes the models outlined above (Koljonen, 2013). It works by focusing on the way journalists interact with knowledge, the way they relate to their audience, how they situate themselves to other institutions and to power in society, how they construct their

relationship to time, and the ethical approach they take in their work (see e.g. Koljonen, 2013). These five orientations, or categories, emphasize journalism’s professional ethos as a multidimensional field of meanings and negotiations, as opposed to a rigid ideology or culture (Koljonen, 2013). I will discuss each category successively.

**Table 2.** Core Orientations of the Journalistic Ethos

<b>Knowledge Orientation</b>	<b>Audience Orientation</b>	<b>Power Orientation</b>	<b>Time Orientation</b>	<b>Ethical Orientation</b>
Objectivity vs. subjectivity	Serving the citizen vs. serving the consumer	Consensus-seeking trust vs. confrontation based on doubt	Orientation to the past vs. orientation to the future	Deontology vs. Consequentialism
Empiricism vs. analysis	Passive recipients vs. Active participants	Passive observers vs. Active interventionists	Gatekeeping vs. agenda-setting	Universalism vs. relativism

*Note.* Adapted from Koljonen, K. (2013). The shift from high to liquid ideals: making sense of journalism and its change through a multidimensional model. *NORDICOM Review: Nordic Research on Media and Communication*, 34, 144-149.

The knowledge category has two dimensions. The first dimensions stretches between objectivity and subjectivity, and the second between empiricism and analysis. Objectivity has long been revered as the mechanism that allows journalism to achieve its basic goals: the dissemination of knowledge and truth. The fundamental premise of objective journalism is that it is possible to separate facts from values, and to achieve adequate correspondence between news reports and reality (Merrill & Odell, 1983; Schudson, 2001). In contrast, subjective journalism is rooted in constructivist thinking and denies the possibility of absolute truth and objective reality (Schudson, 2003). According to this view, journalists are not able to reflect reality as it is, rather, their news reports can only be representations. Furthermore, in subjective journalism the journalist

plays a greater role in selecting and editing news items so that they may become meaningful for the public. In practice, objective journalism generally corresponds with empiricism, namely because the underlying assumption in empiricism is that facts, observation, quantification, and proof are what substantiate truth (Merrill & Odell, 1983). Accordingly, subjective journalism corresponds with analysis, which draws from the journalist's reasoning, ideas, values, and opinions (Merrill & Odell, 1983). A practical way to think about the oppositions in both dimensions is to think of them in relation to journalism's emphasis on the transmission of knowledge vs. journalism's emphasis on the production of knowledge (Koljonen, 2013). High modern journalism was indicative of the transmission of knowledge through objectivity, empiricism, and the desire to separate facts from values, whereas liquid journalism corresponds with subjectivity, analysis, and desire to create "surplus value for their *customers*" (Koljonen, 2013, p. 145, emphasis added).

The first dimension of the audience category stretches between service for citizens and service for consumers. The second dimension stretches between the audience as passive or as active participants. When journalists address the public as citizens, the main goal is a stable democracy and emphasis is given to current affairs in politics and economics. Addressing the audience as consumers implies that journalists see the audience as target groups who need to be informed and guided. In this approach journalists modify their services to accommodate their audience. The consumerist approach is prone to utility news and entertainment (Koljonen, 2013). When journalists perceive of their audience as passive, audience feedback is not taken into consideration, namely because journalists perceive a strict division of labor where journalism is meant

to be exclusively in the hands of the journalist (Carpentier, 2005; Shoemaker & Reese, 1996). In contrast, journalists who view the audiences as participants cede some of their authority by involving laypersons in the journalistic process (Carpenier, 2005). To summarize, journalists can relate to their audience as if it was composed of passive and obedient citizens or active and privatized consumers. The former is indicative of the high modern ethos and the latter conforms to a liquid ethos.

As the intermediary between the public and power holders, journalism also has a power orientation. The first dimension in the power category considers how journalists perceive power holders and stretches between “consensus-seeking trust” and “confrontation based on doubt.” The second dimension considers how journalists themselves broker their power. Consensus-seeking trust regards power holders as cooperative partners who are rarely to be doubted, and “confrontation based on doubt” perceives power holders as competitors worthy of scrutiny (Hanitzsch, 2007; Koljonen, 2013, p. 145). Regarding journalists own role as powerbrokers, journalists act as either passive observers or as active interventionists. When journalists assume the role of passive observers they generally try to implement objectivity, whereas journalists who assume an interventionist role are more likely to advocate a specific mission (Donsbach & Patterson, 2004).

One dimension in the time orientation considers whether journalists make connections between the past, present, and the future. The second dimension considers whether journalists function primarily as passive gatekeepers who adapt to time set by other actors, or active agenda-setters, where they are less dependent on their sources and outside sources. Focus on the past and reliance on sources is indicative of the high

modern ethos whereas future-oriented news is considered a characteristic of the liquid ethos.

Finally, concerning journalism's ethical orientation, one dimension has deontological ethics at one extreme and consequentialist ethics at the other. The second dimension considers whether moral rules are approached from a universal or relativistic perspective. When journalists adhere to deontological ethics they emphasize facts and truth with disregard to the consequences. Adherence to consequentialist ethics, however, leads journalists to focus primarily on the potential consequences of news reports, the goal being to maximize the social good. Considering how moral rules are understood, a universalistic approach adheres to professional rules regardless of a situation, whereas a relativistic approach gives preference to individual judgment and the uniqueness of situations (Hanitzsch, 2007).

To summarize, it is increasingly evident that journalism is undergoing fundamental shifts concerning its occupational values and its material landscape. These changes have raised questions about the current ethos of journalism as well questions about how to appropriately research news in view of its liquidity. This framework of journalistic change can help answer some of these questions because it takes into account the shift from high modern to liquid journalism, while at the same time allowing for a nuanced analysis. Furthermore, it serves as theoretical backing for textual analyses against which contradictory findings can be related to each other (Koljonen, 2013). However, this theoretical framework has not been consistently used to explore changes in different journalistic contexts. In particular, it has not been used to explore science

journalism. In view of this literature and theoretical framework, this dissertation will address the following questions:

RQs. How did a shifting journalistic ethos affect science journalism in institutional newspapers from 2014-2017?

RQ1a How did journalists implement the knowledge orientation throughout news about Crispr in institutional newspapers from 2014-2017?

RQ1b How did journalists construct their relationship to the audience throughout news about Crispr in institutional newspapers from 2014-2017?

RQ1c How did journalists situate themselves in relation to scientific power throughout news about Crispr in institutional newspapers from 2014-2017?

RQ1d How was the relationship to time constructed throughout news about Crispr in institutional newspapers from 2014-2017?

RQ1e What was the ethical approach taken by journalists throughout news about Crispr in institutional newspapers from 2014-2017?

RQ2. What does news coverage about Crispr reveal about the current journalistic ethos?

### Chapter 3: Qualitative Textual Analysis

The main purpose of this section is to establish the appropriateness of the method in view of the theoretical framework and research questions. The underlying assumption is that how journalists write their news reports can reveal insights into the nature of the journalistic ethos. Broadly speaking, my method is case study because I am using science journalism as a case to explore the shift from a high modern to a liquid ethos. However, the heart of my research will be qualitative textual analyses of coverage about Crispr. Textual analysis is a way of gathering information to understand journalists' final product, and it can also be used to understand the likely interpretations that people might make after consuming texts (McKee, 2003). There are three parts that I will discuss in turn. First, I will describe my data gather process. Second, I will provide a general outline of the method. Third, I will provide details about how I will carry out the coding and analysis.

#### **Data Gathering**

I used Proquest Newsstand to collect a purposeful sample of news articles — the primary unit of analysis — from national and regional newspapers that represented institutional journalism. The benefit of a purposeful sample is that it is possible to learn a lot about the topics that are central to the overarching inquiry and can lead to information-rich analysis (Patton, 2002). Two national newspapers featured more than 20 news articles: *Boston Globe* and *Wall Street Journal*. There were 14 articles from 2014, 64 articles from 2015, and 111 articles from 2016 (see the appendix for full of list of publications). I selected filters that only yielded “news.” Search terms included

“CRISPR” anywhere in the text and the exact phrases “gene therapy” and “gene editing” anywhere in the text’s main body. Given that Crispr’s use as a gene-editing tool started gaining notoriety a year after it was made public in 2013, I analyzed coverage between January 2014 and January 2017. Despite selecting the “news” filter in Proquest Newsstand, some of the articles within the results included op-ed articles. Op-ed articles were eliminated from the sample, which led to a total of 186 articles.

### **Evaluative Analysis and Deductive Categories**

The approach to this textual analysis was evaluative and relied on deductive categories (Kuckartz, 2014). I assessed, classified and evaluated content according to the key orientations of journalistic change: knowledge, audience, power, time, and ethics. I treated each orientation as a category and included a miscellaneous category for information that did not conform to the five categories that I “applied” to the text (see e.g., Kuckartz, 2014). The process was reiterative. Where necessary, I modified my research questions or categories. This process was preferred because even though text analysis has to be open, multi-layered, and has to identify preferred frameworks, it also has to be open to alternative readings and frameworks even if such findings can only be understood as contradictions to the dominant framework (Johnson, 1987). Finally, even though the analysis did not feature a quantification component, descriptors such as “generally” and “primarily” were used to refer to the general tendencies. These descriptors were based on this researcher’s best approximations. The entire analysis required four steps:

1. I identified and coded the text passages that were relevant for the evaluative category in question. Codes were based on words, sentences, paragraphs, or entire

texts.

2. I compiled the text segments coded with the same code into a list.

3. I identified three levels for the evaluative categories and assigned them to the text segments. For instance, where appropriate, I differentiated between “highly characteristic” of the category, “relatively uncharacteristic,” and “unable to classify.”

4. Then I offered an in-depth interpretation of the findings that linked them to the concept of liquid journalism and the research questions.

### **Textual Analysis**

The authoritative literature for the various approaches to textual analysis has one commonality: textual analysis requires paying close attention to language. To that end, I appealed to the classical understanding that grammar, rhetoric, and logic are the primary elements of language. Analysis at each of these levels provided insight into the main orientations of the journalistic ethos. Furthermore, when treated as categories, the five orientations of journalistic change achieved the pragmatic aims of every textual analysis (Frueh, 2004; Strauss & Corbin, 1998): They reduced the complexity of texts while describing them according to theoretically relevant characteristics.

To evaluate the knowledge orientation, I focused on conjunctions as well as the overall logic used throughout texts. Conjunctions such as *because*, *if*, *and*, *after*, *since*, *so that*, *although*, etc. generally introduced explanations or reasons that were empirical or analytical.

- The scientists didn’t publish the report *because* they probably felt the pressures of big oil companies (analysis).

- *If* politicians ignore climate change science, it also suggests the public is apathetic about climate change (analysis).
- The report indicated that sea levels *and* Earth's temperature have risen at the rate of X inches and X degrees, respectively (empiricism).

One of journalism's key elements is timeliness, hence most news stories feature temporal relations (Fairclough, 2003; Koljonen, 2013). In order to evaluate how the relationship to time was constructed, I coded for temporal relations. Words indicative of a temporal relation included *after*, *when*, *then*, and *later*. However, journalists' time orientation was also coded by considering the tense of verbs and auxiliaries. The basic distinctions are between past, present, and future.

- Temporal: Politicians *worried after* reading the report (past, temporal).

To evaluate the power orientation, I primarily coded for evaluative statements, which express desirability with evaluative markers (adjectives, verbs, and adverbs) e.g.: science is *good*; the scientist *cooked* the data; the scientist spoke *eloquently*. Moving up in the ladder of abstraction, legitimation is a rhetorical device seeking to establish explanations and justifications of the salient elements of an institutional tradition (Fairclough, 2003). There are four categories of legitimation:

- Authorization: legitimation by reference to the authority of tradition, custom, laws, and powerful persons
- Rationalization: legitimation by reference to the utility of institutionalized action
- Moral evaluation: legitimation by reference to moral value systems
- Mythopoesis: legitimation conveyed through narrative

Additionally, this form of analysis also allowed me to draw logical conclusions about the audience orientation. For instance, journalistic deference to power was coded as journalistic service to passive citizens, rather than service to participating consumers. Journalists' perception of audiences was also coded according to the voice in which they wrote. Voice distinguishes the speaker from the audience. The main distinctions are between first, second, and third person. The use of the first person plural nominative, objective, and possessive case was coded as journalistic attempts to serve an active audience.

- *We* cannot afford to continue using fossil fuels (first person, plural, nominative)
- Fossil fuels are harming *us* (first person, plural, objective)
- The responsibility is *ours* (first person, plural, possessive)

Accordingly, the use of third person singular and plural nominative, objective, and possessive case was coded as journalistic service to a passive audience: she, her, hers and they, them, their.

Finally, the deontological–consequentialist dimension of the ethics orientation was evaluated in terms of journalists' commitment to providing truthful and objective reports about Crispr — a commitment that did not seem to be overridden by considerations of how truthful reports may benefit or be a detriment to the greater social good. This evaluation was informed by the presence or lack thereof of overtly biased or sensational reports. The universal–relativistic dimension was not easily applicable to new reports about Crispr, hence, this dimension was evaluated by seeking out the ethical approach taken by journalists throughout coverage of germline editing — a highly contentious process that allows DNA edits to become heritable. Although such analysis

does not speak directly to how journalists understand journalism's moral rules, it does provide insight into how journalists understand moral rules in general.

In summary, I evaluated how journalists related to the five journalistic orientations by paying close attention to their language. There were different approaches to each level of analysis, and in some cases one approach spoke to more than one orientation. In other instances, analysis of one orientation was used to draw logical conclusions about another orientation.

## Chapter 4: Five Orientations of Science Journalism

As society undergoes a shift from high to liquid modernity, the journalistic ethos is said to be reflecting those changes (Deuze, 2007). The prevailing narrative of journalistic change suggests change is occurring on two fronts: 1) journalism's material landscape is changing as a result of the technologies ushered in by the Digital Age, and 2) journalism's commitment to old categories, namely, truth and objectivity, are increasingly being replaced by news values that more closely align with a post-truth and technologically fluid society: subjectivism, relativism, transparency, and advocacy (see e.g., Karlsson, 2015). But the literature raises questions about the nature of this change. First, the literature complicates the prevailing narrative of journalistic change by suggesting that it lacks nuance and that it tends to either exaggerate or simplify the magnitude of the change that is taking place (Koljonen, 2013). Second, it is possible for the shift from a high to liquid ethos to have different consequences and manifestations in different areas of journalism. That observation stems from research considering the nature of culture journalism (Jaakkola et al., 2015). In view of these objections, this study uses Koljonen's (2013) multi-dimensional model of journalistic change to investigate the ethos of science journalism. Science journalism falls under the category of science communication. And relevant literature suggests science communication as a whole has absorbed some of liquid modernity's changes. For example, the shift from the knowledge deficit to the dialogue model (Bucchi & Trench, 2014; Wynn & Irwin, 1996) resembles the prevailing narrative of journalistic change. The findings in this chapter, however, align with the notion that the prevailing narrative of journalistic change exaggerates the

magnitude of change taking place. Although science journalism has absorbed some elements of liquid journalism, a high modern ethos prevails. This conclusion is drawn through a textual analysis that addresses how Koljonen's five orientations of journalistic change played out in Crispr-related coverage from 2014-2017 (RQ1). Finally, in an effort to underscore the validity and reliability of the findings, each section will begin with a discrepant analysis of news coverage that disconfirmed the main findings and supported alternative explanations (Merriam, 2009; Patton, 2002).

### **Knowledge**

This section answers RQ1a: How did journalists implement the knowledge orientation throughout news about Crispr in institutional newspapers from 2014-2017? The objective journalistic approach during the high modern period encouraged journalistic reporting to avoid assumptions and interpretations that could not be supported by some degree of proof (Carey, 1982; Schiller, 1981; Schudson, 1978; Ward, 2015). Hence, journalists preferred empirical explanations over analytical ones, arguably because it was also taken for granted that facts alone sufficed to interpret the world. In journalism scholarship, this stenographic approach has been thoroughly critiqued (Iggers, 1998; Matterlart, 1980; McGill, 2004; Rosen, 1993). Critiques of objectivity have prompted some journalists to carry out their work in the name of balance and neutrality instead of objectivity. Such was the case throughout news reports about Crispr. That is, journalists acted as detached reporters transmitting facts about the realities surrounding Crispr. But regarding the empiricism–analysis dimension, journalists relied on analytical explanations. Reliance on analytical explanations means that journalists achieved objectivity through stylistic proclivities that are typical of liquid modern journalism.

**Outlying cases.** As a point of contrast, this section will begin by focusing on examples that did not conform to the general pattern in the findings. Whenever journalists wrote in a subjective-style, they included adjectives and value-laden language in their explanations about Crispr or related developments. For instance, in a discussion about using Crispr to treat diseases such as Huntington's, Sanfilippo syndrome, and cystic fibrosis, one reporter added that despite its potential, "Crispr has been in the crosshairs of controversy because of its profound potential to rearrange the basic building blocks of life" (Krieger, 2016, para. 5). That there is controversy surrounding Crispr's use as a gene-editing tool is an objective fact. The journalist proceeded to support the claim by noting that experts had recently gathered in Washington, D.C. to discuss Crispr-related issues (Krieger, 2016). But the controversy itself is not Crispr's potential to rearrange life's building blocks; it is that some view the rearrangement of life's building blocks as problematic, whereas others do not. And by describing the potential rearrangement of life's building blocks as *profound*, the journalist implicitly aligned with the view that human life on Earth is a singularity; something ontologically different from the rest of the planet's life forms. Experts and laypeople holding this view are generally hesitant to tinker with life's elementary elements (see e.g. Sandel, 2009). In contrast, there is the view that human life, despite its peculiarities, has evolved from the same material universe as all other life forms and therefore, existing differences simply result from variation in the organization of a life form's atoms. Experts and laypeople holding this view are generally not hesitant to tinker with life's elementary elements (see e.g. Church & Regis 2014).

Elsewhere, a journalist uses evaluative language to explain that Crispr is what has allowed the bioengineering field to start filling its “outsized expectations.” Reflecting on Crispr, the journalist writes that “a series of jaw-dropping successes” are what have “renewed hopes that some one-time fixes of DNA, the chemical code that governs life, might turn out to be cures” (Marchione, 2017, para. 2). In this example, the journalist suggests that Crispr is the standard for what constitutes a success in gene therapy but does not provide any supporting evidence that specifies which Crispr-related successes have set the standard, nor does she specify why those successes are the standard. The journalist further describes the undisclosed Crispr successes as “jaw-dropping.” The use of hyperbolic language to describe the outcome of Crispr experiments does not conform to the objective-style reporting practice of using words in their most basic sense.

Regarding the analytical–empirical dimension, the following outlying example illustrates an empirical-style explanation for how genes can be edited to reject the transmission of HIV. Writing in relation to the work of Yuet Kan, a professor at the University of California San Francisco, the journalist writes:

Using a technique known as gene editing, Kan's group has singled out the one gene--the one invitation--that codes a protein known as CCR5. For HIV, CCR5 is the key site of entry into CD4+ T-cells--white blood cells the virus uses to replicate itself for survival, proliferation, and transmission (Veeravagu, 2014, para. 3).

This brief account is based on a large body of experimental science. It is an empirical fact that the protein CCR5 has been proven to be coded by a gene that invites HIV into CD4+ T-cells. Although the journalist explains what CD4+ T-cells are, the entire account is

highly technical and it is clear that to be fully understood it demands a reader that is familiar with the study of immunology, virology, or at the very least, it demands familiarity with the basics of biology.

The minority of news stories implemented the knowledge orientation according to the liquid ethos. When this approach appeared, it included adjectives and value-laden language to describe Crispr or related developments. In the first instance, the journalist's use of the adjective "profound" to describe Crispr's potential to edit DNA implied a view of humanity as a singularity. This position is contested among scientists and laypersons, and given its ontological nature, many implications follow from being aligned with it. In the second instance, the use of hyperbole was a sharp departure from the high modern journalistic practice of letting the facts speak for themselves and abstaining from exaggerations. The minority of stories also featured empirical explanations. When they did appear, they were technical explanations that required a background in biology or related fields. In contrast to these counterexamples, in the following section it is demonstrated that journalists implemented the knowledge orientation according to a high modern ethos in the majority of news stories.

**Objectivity as balance.** During the high modern period of journalism, balance was often regarded as one of objectivity's defining characteristics, or in some cases, it was described as one of objectivity's "twin sentries" (Cunningham, 2003; Mindich, 2000; Schudson, 1978). Journalists' implementation of objectivity as balance throughout the coverage involved the practice of presenting multiple, differing, or opposing sides of Crispr-related issues. Furthermore, journalists often relied on expert sources to offer a balanced view. For contrasting effect, consider a story about the first case in which

Chinese researchers created the first genetically modified human embryos. This is the nut graph:

For some researchers working to develop gene therapies, in principle such genome editing could be used to combat inherited diseases. But to others, it also could lead to attempts to genetically enhance humans in ways that could last for generations with unpredictable results (Spotts, 2015, para. 3).

Whereas a lead is meant to entice readers to read the full story, the purpose of nut graphs is twofold: they communicate a story's news value to the reader and they serve as a signpost for how the story will develop. In this example, the nut graph communicates to the reader that there are differing views on genome editing — presumably, that is the news value. But it does not deliver on the promise of giving differing views on genome editing. For instance, the journalist cites several experts in molecular biology sharing a similar sentiment: “The technology...is evolving rapidly because it's so easy to use. But it's easy to use in the sense of making something happen. It's not easy to use necessarily in the sense of making what you want to have happen” (O'Connor-Giles in Spotts, 2015, para. 12). This expert's comment aligns with concerns within the scientific community that genetically enhancing humans could potentially have generational and unpredictable results. Without giving voice to researchers and bioethicists who think that the benefits of genome editing — including the eradication of diseases — outweigh the risks, the story closes by speaking about the urgency among scientists, ethicists, and leaders in the biotech industry to “take immediate, serious steps globally to weigh the legal, ethical, and social implications of manipulating DNA within heritable cells” (Spotts, 2015, para. 31).

Although this story does not fit the mold of subject-style reporting, it is inherently biased in favor of those warning against unbridled use of Crispr.

In a story about the same Chinese experiments that changed human embryos in ways that could allow the genetic change to be inheritable, the journalist's lead and nut graph set up the story in a similar way as the previous example; it is pointed out that Crispr has transformed biology by creating the prospects of a disease-free future, but that some researchers are alarmed, and want to hit the pause button. The first expert source further outlines the story: "It is a really exciting thing and could have a potential impact on disease...But it is also something where we need to tread carefully" (Jacob Corn in Krieger, 2015, para 2). The journalist highlights why some researchers were considering hitting the pause button on Crispr, namely, the journalist points out that Crispr has the potential to "change the genetic code of future generations, redirecting evolution in new, permanent and unimaginable ways" (Krieger, 2015 para. 4). Soon after, however, the reader is presented with an argument suggesting that a complete ban on Crispr's use is impractical and a bad idea. Citing a different expert, the argument is as follows: "Would it be unethical not to fix something if you could? If it were very safe, wouldn't it be wrong not to?" (Enriquez in Krieger, 2015, para. 6). By presenting this view, this story balances out the view that Crispr's potential to redirect evolution's natural course suffices for pausing Crispr-related research. It delivers on the promise that the first story failed to deliver on; it gives voice to researchers who see Crispr as a tool to develop gene therapies that can help combat inherited diseases, even if this implies changing the course of evolution.

Similarly, consider this reporter's lead on a story about Britain's approval of gene-editing technology: "Britain's fertility regulator has approved a scientist's request to edit the human genetic code in an effort to better understand how embryos develop - but critics fear the new technique crosses too many ethical boundaries" (Cheng, 2016, para. 1). After establishing that there are opposing views on Britain's approval of a gene-editing technology, the journalist proceeds to cite an expert from the Francis Crick Institute who was planning to capitalize on the approval by analyzing embryos during their first week of growth. The expert argues that such research is bound to improve the understanding of invitro fertilization. Another expert is cited arguing that the approval is "crucial in ensuring healthy, normal development and implantation" (Braude in Cheng, 2016, para. 4). After citing approving experts, the journalist begins to balance the report:

Yet critics warn that tweaking the genetic code this way could eventually produce a slippery slope that eventually leads to so-called "designer babies," where parents not only aim to avoid inherited diseases, but seek taller, stronger or smarter children with specific physical characteristics (Cheng, 2016, para. 6).

The journalist goes a step further and cites an expert from the advocacy group Human Genetics Alert that is not as optimistic: "This is the first step on a path that scientists have carefully mapped out towards the legalization of (genetically modified) babies" (King in Cheng, 2016, para. 7). Once again, the journalist adhered to the objectivity-as-balance approach by unpacking the oppositions that were established at the beginning of the news story.

Although expert sources permeated the coverage, journalistic adherence to balance was not always manifested as citing the opposing comments made by experts. As

the previous examples showed, sometimes journalists themselves provided the balancing remarks. Keeping with the theme of the pros and cons involved in gene-editing, there is the example of a story covering how gene-editing was used to cure an infant of leukemia. It was reported that after conventional treatments such as bone-marrow transplants failed, gene editing was used to make cells designed to destroy the cancer. The treatment worked. Here the journalist had the option to carry on with a one-sided story that presents gene-editing as a science without caveats. Instead, soon after telling of the successful cure and citing the doctor in charge of the infant's treatment, the journalist relays the reasons that scientists and the public should be cautious: "The treatment has been tried on only one patient so far, with limited follow-up time. While some of the data will be presented at a scientific meeting in Florida in December, the research hasn't yet been peer-reviewed or published in a journal" (Naik, 2015, para. 4). In this instance, the view that gene-editing is a sure-fire way to cure aggressive diseases such as leukemia is balanced by the journalist's empirical observation that this is just one case, and that the case has not been peer reviewed. Furthermore, by balancing the narrative in this way, the journalist tips his hat to sample size and peer review as two important features that scientists use to achieve objectivity.

An almost inevitable consequence of implementing objectivity as balance is that it gives news stories an element of conflict. Conflict, of course, is one of several prized news elements that budding and professional journalists are encouraged to include in their news stories (Craft & Davis, 2016). The idea is that adding an element of conflict will make the news story more compelling and thus, increase its likelihood of being read. In the context of science-related news, implementing objectivity as balance has been

critiqued on that basis that journalists can make it seem that there is conflict within the science community when in fact, no conflict exists. The critique has particularly been made regarding climate change-related news stories (Boykoff & Boykoff, 2004). The charge of pseudo-conflict is not applicable to Crispr-related coverage because the opposing views presented in the coverage are an accurate reflection of the opposing views among bioengineers and bioethicists. The authenticity of the conflict exists in part because Crispr is a new development, and as many journalists concluded through their own accounts or that of experts: the lack of scientific research that uses Crispr impedes definitive conclusions about its benefits and consequences.

The implementation of objectivity as balance throughout the coverage was indicative of the way in which journalists implemented the knowledge orientation according the high modern ethos. But balance was not the sole defining characteristic of objectivity during high modern journalism. In some cases, objectivity was also regarded as entailing a commitment to neutrality (Calcutt & Hammond, 2011; Ward, 2015). Hence, in the following section the focus shifts toward journalist's implementation of objectivity as neutrality in news reports about Crispr.

**Objectivity as neutrality.** Journalists' implementation of objectivity as neutrality involved news stories that simply presented facts surrounding Crispr, rather than offering differing views (objectivity as balance) or favoring one view more than the other (subjective approach). Furthermore, journalists who implemented objectivity as neutrality did not seek to persuade the reader into being in favor of or against Crispr. For instance, in a story headlined "Human embryo genes to be altered," the journalist established that a British researcher received permission to edit the genomes of embryos by using Crispr

despite a voluntary and global moratorium on heritable DNA edits. The story proceeded to offer details about the Britain-based experiment and why it was deemed acceptable despite the moratorium: “Niakan [researcher in charge of experiment], a developmental biologist, has no intention of implanting the altered embryos in a womb...She will let the embryos expire when they are seven days old and have reached the blastocyst, or implantation, stage” (Wade, 2016, para. 5). From there, the story wraps up with two more paragraphs of supplemental information regarding British researchers’ track record in reproductive biology. An unmissable characteristic in this story is the lack of expert sources, which arguably aids the journalist in delivering a neutral story because he is not taxed with having to balance differing expert opinion. Notwithstanding, the following example demonstrates that objectivity as neutrality was also achieved whenever journalists appealed to expert sources.

In one of the earlier stories about Crispr, the journalist is able to offer a neutral account while using expert sources and a narrative-style format. Consider for example the soft news lead: “It is a fascinating quirk of nature: Simple bacteria have an immune system with a memory, which allows them to destroy invading viruses they have encountered in the past” (Johnson, 2014, para. 1). After establishing that scientists have figured out how to repurpose the virus-shedding technique, the journalist simply proceeds to establish that the technique is Crispr, and relies on an expert to elaborate on the role of bacteria in the use of Crispr: “It was cool that the bacteria had invented a way for doing this a billion years ago, but it was not at all clear that would be something you could reengineer for the human genome and the mouse genome (Lander in Johnson, 2014, para. 8). The story then shifts to the history of research into bacteria’s “molecular scissors” and

the developments that led to the implementation of Crispr in laboratory settings. The story closes with an expert's comments: "It's still a huge mystery how we work and just basic biology... We're just trying to figure out this amazingly complicated and sophisticated mechanism we call life" (Mello in Johnson, 2014, para. 17). From beginning to end the story is written as Crispr's biography. All in all, the story featured seven expert sources commenting on Crispr's novelty and potential, rather than weighing in on its benefits and consequences.

The implementation of objectivity as balance or as neutrality throughout Crispr-related coverage was indicative of the objective-style news that characterized high modern journalism. In an effort to offer a balanced account, journalists sought out expert sources that offered opposing or differing views. At times journalists also deferred to expert sources to offer a neutral account. In the absence of expert sources, journalists achieved balance or neutrality by offering detached, third-person explanations. But explanations were not always empirical. Rather, explanations were often analytical, particularly regarding Crispr's history and its inner workings. These findings are discussed in the following sections.

**Analysis: historical context.** One way that journalists adhered to the objectivity ideal was to situate Crispr and Crispr-related ethical issues within their proper historical context. This was adherence to objectivity because it presented the reader with important facts that were conducive to a better understanding and assessment of Crispr. But these facts were not delivered in empirical terms; they were not based on observation and quantification derived from the senses. Instead, journalists communicated Crispr-related

historical facts by emphasizing analysis and explanation through specific knowledge, particularly knowledge specific to the historical development of molecular biology.

For example, in an article titled “The molecular me, tracing the history of the gene,” the journalist connects the dots between Crispr and key historical developments in the molecular biology field. Writing in reference to a book titled “The Gene: An Intimate History,” the journalist calls attention to the historical developments that led to Crispr:

Charles Darwin's voyage on the Beagle, the monk Gregor Mendel observing patterns of inheritance in pea plants, James Watson and Francis Crick deducing the structure of DNA from an x-ray crystallography image by Rosalind Franklin...The heady days of molecular biology research in the late 20th century, as scientists began to unravel how genes are switched on and off, create genetically modified organisms, and link specific genetic mutations to disease...the race to sequence the human genome, the discovery of embryonic stem cells, and the harnessing of CRISPR (Humphries, 2016, para. 10).

These broad historical brushstrokes were not the only ones to reference historical figures such as Darwin and Mendel. Elsewhere in the coverage, a journalist writing in reference to Crispr’s ability to edit genes writes that “this incredible ability makes CRISPR the biggest news to hit animal and plant agriculture since Gregor Mendel, an Augustinian friar, invented the science of genetics two centuries ago” (Guebert, 2015, para. 8).

Writing in reference to Jennifer Doudna, the leading figure behind Crispr’s development, one journalist writes that even though it was bacteria that invented Crispr, not Doudna, “it's an amazingly nifty immune system that testifies to the innovations that emerge from Darwinian natural selection” (Achenbach, 2016, para. 22). The references to figures such

as Darwin and Mendel established that Crispr's development did not happen in a vacuum. Mendel, who is considered the "Father of Genetics," deduced the laws of heredity by observing the patterns of inheritance in pea plants. Accordingly, his findings led him to establish the foundations of modern genetics (Wade, 2010). Given how Darwin's theory of evolution was understood at the time, Mendel's work has been retrospectively regarded as the missing link in Darwin's theory. At the time, Darwin's theory had two leading impediments: the age of the earth and the nature of heredity (see e.g. Ruse, 2010). During Darwin's lifetime leading physicists speculated that the age of the earth was a hundred million years, which was not enough time to fit with Darwin's conception of natural selection. Concerning heredity, for natural selection to have the long-lasting effects outlined by Darwin, the changes had to be conserved by one generation and then passed on to the next (Ruse, 2010). But Darwin's only explanation was that when two organisms mate, their offspring are a mixture of the parent organisms. In short, in order for natural selection to work as Darwin himself understood it, he needed to recognize that natural selection requires tremendous variation. Darwin was not aware of this, but Mendel's work proved to be the missing link in Darwinian evolution. Although the Darwin–Mendel connection was not made as explicit in the coverage, it was implied that their contributions are intimately related, which invites the reader to consider the unfolding of large-scale relationships between biological discoveries that have led to Crispr's development.

Journalists also covered Crispr in the context of the "heady days of molecular biology research in the late 20th century." For instance, a journalist covering the China-based experiments that genetically modified human embryos for the first time put the

experiments in context by writing that “the ability to alter gene sequences was first proven at Stanford University in the 1970s,” but that “genome editing has been slow to reach humans” (Krieger, 2015, para. 3). Here, the author also puts Crispr in context within its field: it had been common knowledge that gene editing was possible for over four decades, which communicates to the reader that Crispr’s emergence was the natural extension of a well-established body of research. The nuance, of course, is that Crispr makes it easier for researchers to engage in the genome editing of humans. But the author further contextualizes Crispr by beckoning the reader to consider that Crispr is also just an extension of research devoted solely to editing genes in humans: “It’s not the first time genes have been edited; other approaches have been used for decades” (Krieger, 2015, para. 3). By contextualizing Crispr in this manner the journalist makes it possible for the reader to understand Crispr in view of the entire molecular biology field.

Regarding the ethical concerns surrounding research that uses Crispr to alter humans, the journalist included that U.S.-based researchers were planning to hold a meeting “modeled after the historic 1975 Asilomar conference on genetic engineering, where scientists created firm guidelines for their research for the military, pharmaceutical industry and agribusiness” (Krieger, 2015, para. 23). In the 1970s scientists were just learning how to manipulate DNA, and a group of scientists sounded the alarm on bioengineering’s potential risks, namely, the conference called for a moratorium on DNA-related work (Berg, 2008). The reference to the Asilomar conference suggests that the ethical concerns raised by Crispr are not new; that the ethical dilemmas surrounding Crispr are themselves the last chapter in decades-old discussion about the ethical implications of editing human DNA.

In a story detailing leading biologists' own call for a moratorium on Crispr experiments that can alter human DNA, the journalist also offered the reader a frame of reference to appropriately understand the modern-day ethical dilemmas surrounding Crispr. First, the journalist explains that biology researchers were calling for a moratorium because Crispr is "so effective and easy to use that some physicians may push ahead before its safety can be assessed," and furthermore, biologists "want the public to understand the ethical issues surrounding the technique" (Wade, 2015, para. 2). But the reader is reminded that this is not uncharted territory: "Ethicists, for decades, have been concerned about the dangers of altering the human germline -- meaning to make changes to human sperm, eggs or embryos that will last through the life of the individual and be passed on to future generations" (Wade, 2015, para. 4). Further into the story the journalist alludes to the Asilomar conference by noting that even though the moratorium would not be legally enforceable, the moratorium has precedent: "In 1975, scientists worldwide were asked to refrain from using a method for manipulating genes, the recombinant DNA technique, until rules had been established" (Wade, 2018, para. 8). The journalist further adds that recombinant DNA — a form of artificial DNA sequence — was one the first steps in manipulating genetic material.

In these examples, journalists' commitment to mention the developments leading up to Crispr and the ethical questions surrounding it gave readers a more accurate account of Crispr, which presumably leads to a public that is better educated and thus, better equipped to draw valid conclusions about Crispr's role in society. Despite their reliance on analysis, journalists' commitment to situating Crispr in its proper historical context was ultimately a commitment to factual information, which is especially characteristic of

the high modern ethos. In addition to providing historical context, the following section further exemplifies journalists' concomitant use of analysis and their commitment to the high modern ethos. Journalists were able to do so by using metaphors to explain how Crispr works.

**Analysis: metaphors.** The primary function of metaphor in news reports about science is to increase knowledge by changing the relationships between designated things (Black, 1993). Journalists' appeal to metaphor has often come from within the scientific community itself. Within the scientific community, metaphor is also used because of its explanatory power. For instance, in research devoted to understanding a particular type of moving gene, scientists commonly regarded the gene in question as a "hitchhiker" gene to help highlight key components of the research, namely that certain genes use other genes to travel throughout the genome (Knudson, 2005). But in this body of data it was journalists themselves who used metaphorical language throughout Crispr coverage.

Journalists' use of metaphors has precedent in news reports about genetics. The preliminary results of the human genome research led to the wide use of the "book of life" metaphor to describe the human genome project (Bostanci, 2010). The appeal to the "book of life" metaphor was that it was able to highlight the importance of the research to broader audiences, namely because of its biblical connotations (Bostanci, 2010). More notable, however, was the appeal to the "blue print" metaphor as a way to describe developments in genetics. This metaphor was critiqued on the basis that it communicated genetic essentialism (Nelkin & Lindee, 1995). It was argued that the problem with communicating genetic essentialism was that it "reduce[d] the self to a molecular entity, equating human beings, in all their social, historical, and moral complexity, with their

genes” (Nelkin & Lindee, 1995, p. 2). Furthermore, it was argued that this representation was problematic because it could lead to discrimination. The reasoning was that mere media exposure to an understanding of humans as just molecular beings would lead to a decrease in resources geared toward fixing social problems because biology would be given credit as the most suitable science to determine the human condition (Condit, 1999). Given that most discourses about genetics imply some degree of biological essentialism, some biological essentialism was inherent in metaphors used to explain Crispr. But the key difference was that the metaphors suggested that science had finally figured out a way to circumnavigate the laws of genetics. Overall, the metaphors used to explain Crispr presented the reader with specific knowledge that was conducive to gaining a better understanding.

For example, in an article about the scientific breakthroughs of 2013, the journalist explained that Crispr is short for clustered regularly interspaced short palindromic repeats and adds that they are: “repetitive stretches of DNA that bacteria have evolved to combat predatory viruses by slicing up the viral genomes. The ‘knife’ is a protein called Cas9; in 2012, researchers showed they could use it as a scalpel to perform microsurgery on genes” (Coontz, 2013, para. 5). In these two short sentences the journalist uses at least five metaphors to explain how Crispr works. First, he appeals to war and organisms’ trophic level — an organism’s position in the food chain — to explain bacteria’s immune system. An alternative way to communicate the same information without metaphor looks something like this: “bacteria have evolved an immune system that provides resistance to harmful viruses.” The alternative is straightforward enough that the average reader would be likely to understand the concept.

But “combat” invokes the well-known trope of conflict between two forces. In this case bacteria are the good force resisting the bad force: viruses.

Then the author uses the surgery metaphor, including the knife and scalpel metaphors, to explain Cas9’s function. The surgery metaphor was especially common throughout the coverage. In a 2014 news story a journalist wrote that “Scientists hope Crispr might also be used for genomic surgery, as it were, to correct errant genes that cause disease” (Pollack, 2014, para. 5). In both cases the journalists had the option to explain Crispr in a more straightforward manner. For example: “Cas9 causes double strand breaks in DNA.” But according to some estimates, the average American has up to six surgeries throughout their lifetime (Lee & Gawandee, 2008). Going “under the knife,” is an experience that most people can relate to or understands, which renders the surgery metaphor a suitable figure of speech to advance the public understanding of Crispr’s inner workings.

Another common experience that most people can relate to is writing with word processors. Accordingly, the word processor metaphor was also used to explain how Crispr works. In a story about a research team’s first use of Crispr, the journalist wrote that Crispr works by combining “a ‘guide RNA’ - a genetic version of the search function in a word processor - with an enzyme that acts like scissors” (McCullough, 2014, para. 7). Other examples included:

- “It combines a synthetic “guide RNA” - a genetic analogue of the search function in a word processor - with an enzyme that acts like a molecular scissors” (McCullough, 2017, para. 4).

- “It consists of several molecules: One makes a beeline for the specific DNA that scientists want to change, another snips out that DNA, and -- for some uses -- a third replaces that DNA, much like a word processor's ‘find and replace’ function” (Begley, 2016, para. 6).
- “To start, it works like a search button on your word processor. Scientists can easily program it to find a specific string of letters in a DNA sequence” (Netburn, 2017, para. 10).
- “That's because of CRISPR, the gene-editing technique that lets scientists manipulate the genetic code of organisms almost like revising a sentence with a word processor (Achenbach, 2017, para. 2).
- “This means a genome can be edited, much as a writer might change words or fix spelling errors” (Pollack, 2014, para. 6).
- “This refers to using molecular scissors to make precise changes to DNA, just as one might edit a word in a document” (Pollack, 2015, para. 17).

Throughout the coverage, the surgery and word processor metaphors facilitated understanding that otherwise would not have been available to the reader; they explained a new scientific development in terms of known things. Whenever metaphors are not being praised for their explanatory power, they are critiqued for excessively oversimplifying scientific processes, which in turn have the opposite effect: they leave the audience in the dark concerning scientific developments. On the one hand, trying to explain anything that happens at the molecular level in terms of metaphor is an excessive oversimplification. On the other hand, metaphor is the best way to make molecular-level activities known to non-experts. Furthermore, the new set of metaphors that were used to

explain the new wave of science about genetics marks a shift from presenting genetics as essentialism to presenting genetics as malleable. The book of life metaphor, and particularly the blue print metaphor, both implied that genes were set in stone, so to speak. But as the science has advanced, the new wave of metaphors suggest that the self can no longer be reduced to a molecular entity, and that human beings can bypass their genes, the book of life, the blue print. Ultimately, journalists' use of metaphor helped convey factual information about genetics to the audience, and focus on conveying factual information is one of the defining characteristics of the high modern journalistic ethos.

**Summary.** This section answered RQ1a: How did journalists implement the knowledge orientation throughout news about Crispr in institutional newspapers from 2014-2017? In Koljonen's (2013) model, the knowledge orientation has two dimensions: the objective–subjective dimension and the empiricism–analysis dimension. Concerning the former, institutional newspaper coverage of Crispr from 2014 to 2017 was primarily objective. Objectivity was implemented as balance and neutrality. When coverage in the mold of subjective journalism did appear, it was value-laden and only presented one-sided accounts of Crispr-related developments. Regarding the empiricism–analysis dimension, journalists covering Crispr from 2014 to 2017 primarily relied on analytical explanations. This was especially evident through journalists' efforts to properly contextualize Crispr by giving historical accounts and by explaining how Crispr works through metaphor.

Koljonen's model appropriately suggests empiricism and analysis exist on opposite ends of a continuum. The appeal of conceptualizing the empiricism–analysis

dimension in terms of a continuum is that it eliminates a rigid either/or approach to understanding journalistic change. Again, one of Koljonen's main aims with his model is to move away from what he considers to be the simplistic high modern–liquid dichotomy. In any case, Koljonen's model is also rigid in the sense that it implies that analytic explanations lead to subjective-style reporting and that empirical explanations lead to objective-style reporting. But these findings suggest that it is possible to have objective-style stories in the mold of neutrality and balance, but whose explanations are primarily analytical, not empirical. Simply stated, analysis can be used to communicate objective knowledge. But Koljonen's model — despite its multi-dimensional qualities — does not account for this.

Upon recognizing that analysis is also suitable to communicate objective knowledge, the noticeable difference between the two approaches is a difference in style. A *prosaic–poetic* dimension (see e.g. Merrill, 1989) can be used to address objective news that is carried out through analysis and in particular, science journalism's stylistic shift from mechanistic and stenographic writing to writing that is concomitantly committed to objectivity and analysis. Prosaic-style journalism aligns with the detached and objective journalism that is expected of high modernism. In poetic-style journalism, journalists express more freedom by presenting a bigger picture, often through the use of narrative. The use of narrative, however, is not in opposition to factual information. Narratives have a fixed pattern and show the cause and effect between events that happen during particular time and place, as was the case when journalists presented Crispr in its proper historical context. While objectivity remains a guiding ethic in science journalism, objectivity is being packaged through analytical explanations. The stylistic shift is

arguably conducive to the public understanding of science. The scientific commitment to Occam's razor and parsimony is suitable within a scientific environment where the audience is primarily made up of experts who share a common understanding about a given topic. But science journalism's primary audience are non-experts, which makes it expedient to package technical information in analysis-style format. The fact that science journalism's primary audience are primarily non-experts is further explored in analysis pertaining to Koljonen's second orientation of journalistic change: audience.

### **Audience**

This section answers RQ1.b: How did journalists construct their relationship to the audience throughout news about Crispr in institutional newspapers from 2014-2017? The assumption surrounding the shift from a high modern to a liquid ethos has to do with audience engagement. It is assumed that institutional journalism has gone from conceptualizing its audience as being passive to conceptualizing its audience as being active (Hanitzsch, 2007; Koljonen, 2013). Broadly speaking, science communication's shift from a deficit to a dialogue model parallels the supposed shift taking place in institutional journalism (see e.g., Bucchi & Trench, 2014). When the audience is conceptualized as passive, the main focus for journalists is to inform for the sake of a healthy society. Similarly, in the deficit model of science communication journalists readily assume the role of filling knowledge gaps about science among the public. In contrast, when journalists regard the audience as active, their goal is to identify the audience's needs and then proceed to provide information conducive the management of daily life (Koljonen, 2013). Furthermore, conceptualizing the audience as active leads journalists to seek a close relationship with readers. Accordingly, in the dialogue model

of science communication it is assumed that the audience is abreast of scientific developments and can contribute to content production. Hence, the goal is to establish two-way communication. In addition to considering how journalists perceive audience engagement, Koljonen's model takes into account whether journalists perceive of their audience as citizens or consumers. Although these are technically two dimensions, they are collapsed into one. The presumption is that an audience perceived as citizens are also perceived as being passive and vice versa.

The following analysis begin once more with analysis of findings that that disconfirmed the main findings. Then it will be demonstrated that concerning the passive citizen–active consumer dimensions, journalists reporting on Crispr conceptualized their audience as both passive citizens and *passive* consumers. That is, journalists covering Crispr sustained their clout as gatekeepers of Crispr-related information, both to educate citizens and future consumers of science-related products, but they did not seek to establish dialogue.

Instances in which journalists conceptualized the audience as active involved stories in which journalists assumed the audience was highly knowledgeable about science. The audience was perceived as consumers in stories about the business side of Crispr, particularly its potential impact on the manufacturing and service industry. The more alluring of these stories focused on the dystopian notion of “designer babies.” In plain terms, Crispr technically makes biological customization possible, and it did not take journalists a great leap of imagination to conjure up the prospect of using this advancement in genetics as a tool for designing the ideal baby. In turn, this framed

genetic research as existing on the borderland between the manufacturing and service industries.

**Outlying cases: audience as active consumers.** Regarding journalists' assumptions that readers were highly knowledgeable about science, consider these remarks from a story about cancer immunotherapy, a scientific achievement on par with Crispr. After explaining that scientists have struggled for decades to make the treatment work, the journalist writes that they have turned a corner because two different techniques are working on a subset of patients: "One involves antibodies that release a brake on T cells, giving them the power to tackle tumors. Another involves genetically modifying an individual's T cells outside the body so they are better able to target cancer, then re-infusing them so they can do just that" (Coontz, 2013, para. 3). For people with a working understanding of immunology, knowledge about T cells are rudimentary. It is unlikely, however, that the average reader knows T-cell's textbook definition: a type of white blood cell produced or processed by the thymus gland and actively participating in the immune response. Furthermore, it is unlikely that the average reader would know the implications of *releasing a brake on T-cells* or what the process of *modifying cells outside the body* actually looks like. Alternatively, the journalist could have communicated the same information by writing: "One involves making immunity cells more active...another involves improving the quality of immunity cells."

Elsewhere, the audience was conceptualized as active consumers in relation to Crispr's impact on the food industry. A story titled "We should talk DNA modification raise specter of biological change," the leading paragraph reads as follows:

With little fanfare and barely a nod of public acknowledgement, the world of food turned upside down April 13 when the U.S. Department of Agriculture informed a Penn State University plant pathologist that the white button mushroom he developed by removing some of its genetic material is not a genetically modified organism...As such, USDA declared, the new mushroom will not be regulated by USDA's Animal and Plant Health Inspection Service (“We should talk DNA,” 2016, para 1 & 2 ).

The story’s title sets the tone with the first-person plural and inclusive *we*. The title’s use of *we*, alongside the use of the imperative mood is a direct invitation to the audience to be part of the dialogue surrounding Crispr. Furthermore, the audience is informed that the changes taking place have the USDA’s consent. This indicates that changes are underway and officially sanctioned, which is essential information for a future consumer. White button mushrooms, of course, are not a ubiquitous food. But dairy products are. Crispr’s effect on the food industry were made more explicit throughout coverage about Crispr’s use in the dairy industry, and this coverage primarily perceived the audience as passive consumers.

**Audience as passive consumers.** In a story explaining that there are companies devoted solely to selling bacteria cultures to dairy farmers, the journalist wrote that “cheese and yogurt companies can examine Crispr regions to see if their bacterial cultures are immunized against particular viruses that could slow production” (Pollack, 2014, para. 17). The upshot for the cheese and yogurt companies is that they can use Crispr to ensure they are purchasing viable bacteria. The benefit for consumers is that it informs them about the production of popular products and developments that may affect

their price. All in all, these examples alert the audience about Crispr's impact on the food industry, which is one of the only industries that affects every single human earth.

The more enticing stories that perceived the audience as passive consumers dealt with the prospect of designer babies. To illustrate, the following example captures the essence of these stories:

Throughout time, technological advances — from robotics to the Internet — have promised to elevate everyone's well-being, but instead often amplified economic divisions. Why would germline editing — modifications to sperm, eggs, or embryos that are passed down to future generations — play out any differently? (Rochman, 2017, para. 4).

These lines highlight that just as efforts toward a Global Village through the Internet also led to a digital divide, efforts toward a disease-free and enhanced humanity through Crispr are also likely to have negative and unforeseen consequences. It is also implied that only people in power would have access to Crispr, and that their use of Crispr would only ensure that they remain in power.

**Audience as passive citizens.** To a large extent, the way journalists implemented the knowledge orientations was indicative of their conceptualization of the audience as passive citizens. The focus on objective-style reporting and analytical explanations was geared toward educating the audience, not necessarily building dialogue; it required journalists to assume the role of disimpassioned educators.

Keeping in line with the detachment from the subject and audience that is typical of objective-style reporting, one journalist wrote about Crispr and its impact on humanity

in highly analytical terms and in the third person. After briefly mentioning the first studies that eventually led to Crispr's discovery, he wrote:

The sequences, it turns out, are part of a sophisticated immune system that bacteria use to fight viruses. And that system, whose very existence was unknown until about seven years ago, may provide scientists with unprecedented power to rewrite the code of life. In the past year or so, researchers have discovered that the bacterial system can be harnessed to make precise changes to the DNA of humans, as well as other animals and plants (Pollack, 2014, para. 3 & 4).

Similar to the way in which journalists gave an objective account of Crispr by providing sufficient context and using metaphorical language, here the journalist also educates the audience by communicating Crispr's importance within the scientific community. The journalist especially displays his role as disimpassioned educator by writing that Crispr allows for precise changes to the DNA of *humans*. This implies that the journalist is so far removed from the subject at hand that he is unaffected by or outside of any research involving edits to human genome.

**Summary.** This section answered RQ1.b: How did journalists construct their relationship to the audience throughout news about Crispr in institutional newspapers from 2014-2017? In Koljonen's (2013) model, the audience orientation has two dimensions: the active-passive dimension and the citizen-consumer dimension. When journalists covering Crispr from 2014 to 2017 conceived of the audience as passive citizens, they cast themselves into the role of educators by covering Crispr in a detached and objective style as well as being realistic about what Crispr is and is not capable of doing; they conceived of their audience as citizens who may have to eventually act on

Crispr-related policies. Whenever journalists conceived of the audience as consumers, the coverage focused on Crispr's impact on the food industry and its potential to lead to the so-called designer babies.

According to Koljonen's model, journalists' conceptualization of the audience as citizens is indicative of conceptualizing the audience as passive because it calls for journalists to transmit information that only they are informed of. Accordingly, the model implies that whenever journalists conceptualize the audience as consumers, journalists are seeking to engage an active audience in the co-production of knowledge. But this study suggests that conceptualizing the audience as consumers does not necessarily mean that journalists are seeking to establish a closer relationship with their audience. Simply stated, journalists covering Crispr were reluctant to relinquish their authority over the gates that control the flow of Crispr-related information into the public sphere. And the information they were controlling included information geared toward an audience that was also conceived as consumers. This finding complicates the high modern-to-liquid ethos narrative as well as Koljonen's (2013) model. It suggests that it is possible for science journalists to conceive of their audience as passive citizens as well as passive consumers. Journalists' conception of the audience as passive further suggests that a liquid modern conception of audiences has not entirely uprooted high modern audience conceptions. This observation of course, is limited to science journalism carried out in print newspapers because print newspapers lack comment sections, which are one of the most common ways in which journalists open the gates and allow for dialogue and the co-production of content. Journalists' control of information is largely a matter of how much power they have as society's gatekeepers. The following section delves further into

the subject of power, science, and journalism.

## **Power**

This section answers how journalists situated themselves in relation to scientific power throughout news about Crispr in institutional newspapers from 2014-2017 (RQ1c). Although American politics have served as the primary context for commentary about journalism's relationship to power, science also makes for a good case study. Politics and science are worlds apart in terms of their guiding methods. The scientific method presumably shields science from falling into the "politics as usual" trap that prevails in the political realm. But science and politics are related and derive much of their power from their symbiotic relationship: Science-based policy is usually a win-win for politicians and the public; in turn, this puts science in a position to shape policy (Bubela et al., 2009). Such was the case with the rise of biotechnology in the 1970s — when it first became possible to exploit biological processes for industrial purposes. The discovery of Crispr is the latest chapter in these developments. When scientific discovery can impact markets, science's power goes beyond what it is able to do in the lab, its power is also to shape public policy

Regarding power, the underlying assumption in the literature about the shift from high modern to liquid journalism is that journalists are intermediaries between the audience and powerful institutions. Koljonen (2013) conceptualizes the well-established shift from consensus to adversarial journalism as consensus-seeking trust vs. confrontation based on doubt. In addition, Koljonen adds a second power-related dimension. Similar to the question of whether journalists perceive of the audience as

active or passive, journalists themselves can assume passive or active roles in relation to powerful institutions.

Journalists' insistence on educating the public about Crispr's limitations was in some ways indicative of journalist's playing an active-confrontation role. Delving into Crispr's limitations offered a realistic account of what Crispr is truly capable of doing. But sciences' limitations were constantly hedged throughout the coverage. Overall, this headline summarizes journalists' relationship to scientific power throughout most of the coverage: "Could gene editing help avoid disease? Maybe." The headline at once legitimizes science for its ability to cure disease, but the adverb "maybe" immediately calls scientific power into question. The story's lead works in a similar way: "Don't expect designer babies any time soon - but a major new ethics report leaves open the possibility of one day altering human heredity to fight genetic diseases, with stringent oversight, using new tools that precisely edit genes inside living cells" (Neergard, 2017, para. 1). Again, the journalist shines light on the power science has to cure disease, but the audience is reminded that it will only do so if it is closely monitored. More specifically, journalists were active and confrontational by delivering a balanced account of the risk and uncertainty surrounding science. Given that the scientific community is sometimes interested in shaping policy and almost always interested in shaping the public's understanding of science (Lewenstein, 1992), journalists are faced with sifting through a plethora of knowledge claims. Accordingly, some journalists "counter by stressing the controversial nature of such claims; some claim near consensus, if not certainty, with respect to what scientists think they know" (Stocking, 1999, p. 23). On the

other hand, journalists were passive and consensus-seeking through their strict reliance on expert sources and by legitimizing science through rationalization.

**Active and adversarial: risk and uncertainty.** Journalists were consistent in calling attention to Crispr's controversial nature. To some extent, journalists' called attention to Crispr's risks when they conceptualized their audience as consumers and pitched the idea that it could potentially lead to designer babies. The implied risk was that designing babies could easily lead to the wide-scale practice of eugenics. Furthermore, genetically engineering a superior baby would be expensive, which means that only those who are wealthy would have access to such service, thus creating a feedback loop that could potentially ensure the concentration of power and wealth — a controversial and unfavorable outlook to be sure. But the risk of a dystopian future has less to do with the science itself than what people decide to do with the science. Journalists were especially consistent in calling attention to Crispr's limitations, not just how people could misuse it and the dystopian future it could lead to. The following example illustrates the point:

Editing a higher multicellular organism such as a human is vastly more complicated than altering single cells in a petri dish. CRISPR has been hailed as a breakthrough because of its ease of use and low cost, but these are relative to what was previously available. It's still pretty hard to tinker with anything more complicated than a microbe, and of course we haven't the slightest idea what genetic changes would be necessary to add wings or extra arms (Jorgensen, 2016, para. 6).

In this example, the journalist seeks to set the record straight on Crispr's strengths and limitations by putting it in context. A human being is a multi-celled organism and while

fully sequenced, the human genome is not fully understood. The journalist implies that there are risks and uncertainties should Crispr be used on humans. The risks and uncertainties, however, were made explicit throughout the coverage. These discussions were centered on the problem of the so-called “off-target cuts” in which Crispr inadvertently snips unintended DNA sequences. Journalists initially called attention to the risk of off-target cuts following the China-based studies that used Crispr to edit human embryos for the first time: “Last spring's experiment in China highlighted that ethics aside, embryo editing wasn't anywhere near ready for real-world use for safety reasons: Those off-target edits risked fixing one problem only to create another” (Neergaard, 2015, para. 11). Commentary such as this prevailed throughout the coverage:

- Quick is not always accurate, however. While Crispr is generally precise, it can have off-target effects, cutting DNA at places where the sequence is similar but not identical to that of the guide RNA (Pollack, 2014, para. 23).
- Perhaps the biggest issue left to solve involves off-target cuts, which occur when Cas9 gets a bit snip-happy and chops the genome in unintended places. These mistakes can cause big problems, including cell toxicity and cancer (Kim, 2015, para. 25).
- Among the biggest risks is “off-target” edits that could lead to a whole host of other issues beyond the disease the patient started with. associate themselves with the scientific community (Cha, 2017, para. 14).
- Previous experiments have run into problems. Sometimes the Crispr system made cuts in unintended spots of the DNA, which can potentially introduce other health issues (Marcus, 2017, para. 12).

Two years after the China-based studies, a research project in Oregon was able to successfully edit harmful genetic mutations in human embryos without off-target cuts. The study was published in the journal *Nature*, and the journalist described it as a “blockbuster report.” Even so, the story’s central aim was to emphasize the risks and uncertainties involved in taking the research a step further:

But advancing to the next step -- allowing pregnancies to proceed with altered embryos -- will require further debate, the genetics specialists said. They cited persistent uncertainties regarding the safety of gene-editing techniques. They also said the ethical implications of “germ-line” editing, which would affect a patient's offspring, remain insufficiently considered (Healy, 2017, para. 7 & 8).

Despite a considerable advancement regarding the problem of off-target cuts, the journalist echoes expert opinion to emphasize that Crispr remains an unsafe strategy to use on humans. Accordingly, journalists writing in view of these risks underscored the uncertainties surrounding future uses of Crispr: “And the first drugs based on Crispr-Cas9 will probably target diseases that can be treated by simply knocking out a defective gene, because it isn't yet feasible to easily replace it with a new segment of DNA, according to Editas's Ms. Bosley (Rockoff, 2015, para. 19). Again, the journalists echoed expert opinion to remind readers of the risk and uncertainty attached to Crispr’s current use, as well as its use in the near future.

These findings demonstrate that journalists were willing to challenge a narrative that presented Crispr as an unqualified success. They focused primarily on the problem of off-target cuts and even when the research community made advancements toward solving that problem, the coverage did not present those breakthroughs as a sign that

Crispr had officially become the most viable method to edit DNA. As the last two examples demonstrate, however, the journalists did not always highlight Crispr's risks and uncertainties on their own accord. In many instances, they were simply relaying commentary and insights coming from within the science community. That is, despite highlighting Crispr's limitations, they did so on scientists' terms. This reliance on experts inevitably situated journalists as passive and consensus-seeking in relation to the scientific establishment.

**Passive and consensus-seeking: reliance on experts.** Journalists' passivity and consensus-seeking in relation to the scientific community happens in the context of a complicated relationship between scientists and journalists:

- To scientists, the devil is definitely in the details, while journalists are interested primarily in the big picture.
- To scientists, disputation is part of the process of advancing understanding ever closer to truth; to journalists conflict is the source of drama that adds zest to a story.
- To scientists, peer review is an integral part of a process designed to reduce errors. To most journalists, allowing sources to review material before publication is an unacceptable ceding of editorial independence.
- To scientists, technical terms provide added precision and clarity to discourse. To journalists, technical terms constitute a jargon that obfuscates science and makes it incomprehensible to the general reader (Salisbury, 1997, p. 222).

Despite these differences, journalists stand to benefit from relying on experts — journalists implementation of objectivity as balance was itself an indicator of journalists'

reliance on experts. In plain English, not all sources are created equal. The perceived value of a story often exists in proportion to the quality of its sources. Hence, it is in journalists' best interest to appeal to sources that have a high degree of clout.

Furthermore, expert sources often speak in the name of science, which is commonly revered as the practice that will rid the world of its problems.

The absence of human sources is perhaps the best indicator of journalistic reliance on expert sources. Out of all of the stories, only one featured an ordinary person as a primary source. This was the story of Brian Madeux, a 44-year-old who was the first to have gene editing inside his body in an effort to permanently cure him of Hunter syndrome. Madeux received billions of copies of the corrective gene alongside a molecular scissor similar to Crispr. He was the first person cited in the story: "It's kind of humbling to be the first to test this...I'm willing to take that risk. Hopefully it will help me and other people" (Madeux in Marchione, 2017, para. 3). But for the remainder of the story, journalistic appeal to expert sources prevailed. Such was the case for the coverage as a whole.

In the following example, George Church, a professor of genetics at Harvard Medical School cites his experience with using Crispr: "As soon as we started playing with it in the lab, it became evident that not only was it something that worked well and worked efficiently, it was super easy to do" (Church in Johnson, 2014, para. 5). After briefly explaining what Crispr stands for, the journalist lauds Crispr as a "shoo-in" for a Nobel Prize and continues:

...The rapid progress and wide adoption of the technology have depended critically on the work of local leaders, who have pushed the process forward by

proving that it worked in cells of all types, ranging from zebrafish embryos to mouse and human cells. The technique has become so ubiquitous that it has entered the casual vernacular of science as a verb; people talking about “CRISPRing” genes they want to tweak or delete (Johnson, 2014, para. 6).

This story is from the *Boston Globe*, which means that Harvard Medical School is a short 15-minute drive down Storrow Drive. It is a textbook example of a journalist claiming near consensus regarding the expert’s claims. The example goes further; it also credits local scientists for getting Crispr to a high level of effectiveness and ubiquitousness. While Crispr has indeed become ubiquitous, the previous section clearly demonstrates that questions about its effectiveness remain. Regardless, the journalists passively accepted Church’s claims that Crispr works well and efficiently.

*Legitimation through rationalization.* Powerful institutions are legitimized through rationalization whenever good reasons are given for their actions (Fairclough, 2003). Throughout the coverage, the scientific community’s use of Crispr was legitimized by underscoring that it was rooted in the scientific process and accordingly, that its potential to become the primary method of curing disease was merely a matter of more experimentation and time. For example, in a story titled “A new path toward curing sickle cell disease” the opening paragraphs read as follows:

The promise of a revolutionary gene-editing technology is beginning to be realized in experiments aimed at curing sickle cell disease. Scientists reported Wednesday that they used the CRISPR-Cas9 system to correct a tiny genetic mutation that causes the blood disease, which affects millions of people around the world. So far, the feat has been shown only in human cells confined to lab

dishes. But in a promising step, the researchers used the same DNA-editing technique to alter human cells transfused into mice. After 16 weeks, the mice still had cells that contained the edited gene, according to a study in the journal *Science Translational Medicine* (Netburn, 2016, para. 1-3).

In the following paragraph, the journalists appeals to an expert's opinion, which works to solidify the notion that it is only a matter of time for the scientific process to deliver on Crispr's widespread use: "What we have right now, if we can scale it up and make sure it works well, is already enough to form the basis of a clinical trial to cure sickle cell disease with gene editing" (DeWitt in Netburn, 2016, para. 4). A story such as this one offers the journalist ample opportunity to cast into an active and adversarial role. The journalist could have stressed that getting lab-dish results to be as effective in a multi-cell organism is a laborious and lengthy process that mostly consists of failures. Also, following the experts lead, the journalist takes for granted that successful experimentation on mice models is a sure-fire way to achieve success on humans. An active and adversarial alternative would be to point that using mice are actually bad models to predict what will happen in humans because of their long telomeres. Telomeres are at the end of chromosomes and protect genes during cell reproduction and chromosomal duplication. Given that mice have unusually long telomeres compared to humans, the results of experiments carried out on them are often deceiving. But instead, the journalist takes for granted that with more research and experimentation, Crispr will be eventually play a significant role in curing disease.

**Summary.** This section answered RQ1.c: How did journalists situate themselves in relation to scientific power throughout news about Crispr in institutional newspapers

from 2014-2017? In Koljonen's (2013) model, the power orientation has two dimensions: the consensus-adversarial dimension and the passive-active dimension. Whenever journalists situated themselves as active and adversarial in relation to Crispr, they were keen on pointing out the risks and uncertainties surrounding Crispr, namely, journalists called attention to the problem of off-target cuts. But it was scientific experts who often set the parameters for discussing Crispr's risks and uncertainties. And letting the scientific establishment's experts set the parameters is characteristic of seeking consensus and acting as passive observers. In addition to reliance on expert sources, and allowing them to dictate the discussion, journalists also sought consensus and acted as passive observers by legitimizing the scientific process.

Journalists' relationship to power has been a central topic in scholarship about changes to the journalistic ethos (Jaakkola et al., 2015; Koljonen, 2013). All in all, these findings suggest that journalists primarily adhered to a high modern ethos by situating themselves as consensus-seeking and passive in relation to science. Rather than seeking to produce information independently and interpret or criticize the information provided by expert sources, journalists covering Crispr opted to maintain a stable relationship (see e.g. Jaakkola, et al., 2015). One possible explanation for this finding is that despite the complicated relationship between scientists and journalists, science and journalism still share a fundamental aim: the pursuit of truth. Had journalists undermined the value of Crispr, the expert sources, and the scientific process as a whole, journalists would have also indirectly undermined journalistic practice.

## **Time**

This sections answers RQ1.d: How was the relationship to time constructed

throughout news about Crispr in institutional newspapers from 2014-2017? In Koljonen's (2013) model, the time orientation also has two dimensions. The first dimension focuses on whether journalists orientate the subjects they cover toward the past, present, or future. The second dimension focuses on how journalists manage time: do journalists adapt to the time set by other social actors, or do they set the schedule for other actors? Given that nature of textual analysis, commenting on the second dimension is beyond the scope of this research. Hence, this analysis focused solely on the first dimension.

The standard narrative of journalistic change suggests that in the shift from high modern to liquid journalism, journalism has shifted its focus from the past to the present and future; the high modern journalist would ask what had happened and what had been said, whereas the liquid journalist is said to ask what is happening now and what will happen next (Koljonen, 2013). But throughout the coverage, none of these time orientations prevailed over another. Hence, two different categories were created for text that featured time elements but that did not conform the model (Kuckartz, 2014): *presentism* was on one extreme of the spectrum and *eternalism* was on the other end. In most accounts of the philosophy of time, presentism is the idea that it is always true that the only objects that exist are those existing in the present moment (Markosian, 2016). To illustrate, a journalist writing according to presentism would write without any allusions to the past and focus primarily on topics about the here and now. Eternalism suggests that both past and future objects exist along with objects existing in the present (Markosian, 2016). For instance, the writing of a journalist operating according to eternalism would freely make allusions to objects from the past, present, and the future. These findings suggest that journalists covering Crispr were decidedly eternalists. The analysis below

begins by providing examples that illustrate how neither of the time orientations in Koljonen's (2013) model prevailed over the other. Then the majority of the findings, which discussed Crispr in relation to the past, present, and future, are discussed. Time-related elements in the text primarily discussed Crispr in the context of its potential to cure diseases. Allusions to the past were present in stories providing historical context (discussed in the section on knowledge), and Crispr related events that were only one or two days old.

**Problematic cases.** Some leading paragraphs included a mixture of time orientations. The following examples illustrate:

- Scientists for the first time have successfully edited genes in human embryos to repair a common and serious disease-causing mutation, producing apparently healthy embryos, according to a study published Wednesday. The research marks a major milestone and, while a long way from clinical use, it raises the prospect that gene editing may one day protect babies from a variety of hereditary conditions. But the achievement is also an example of human genetic engineering, once feared and unthinkable, and is sure to renew ethical concerns that some might try to design babies with certain traits, like greater intelligence or athleticism (Belluck, 2017, para. 1).
- It's a scenario that has haunted biologists since the dawn of the DNA age: the evil scientist custom-crafting a human being with test tubes and petri dishes. So when a Chinese team revealed last month that it had used a new laboratory technique to alter a gene in human embryos, it set off an urgent debate over the ethics -- and wisdom -- of tinkering with the most basic building blocks of life. The technology

makes genetic manipulations that were theoretical in the past seem easy to achieve -- and soon (Brown, 2015, para. 1-3).

Stories such as these did not conform neatly to past, present, or future time orientations. They were neither solely stenographic recording of past events, a reflection of current events, or blind predictions about what was in the future.

**Curing disease now and in the future.** A story titled “Rushing into future with gene tool could curtail past” exemplifies the combination of present and future-oriented coverage. The story opens:

About the only one ever happy to see a mosquito is a hungry purple martin, the acrobatic swallow that dines on the bothersome insects morning, noon, and night. You and I, however, would be perfectly happy never to see another mosquito for the rest of our lives. Science can now make that happen (Guebert, 2015, para. 1 & 2).

The opening sentence is in the present tense, which is signified by the present tense use of the verbs *is* and *dines*. In the second sentence, however, gauging the time orientation is not as straight forward because of the modal verb *would*, which is generally the past of *will*. But in this context the primary function of *would* is to express the conditional mood and to indicate the consequence of a future event: not seeing a mosquito again. The closing sentence clearly invokes the present tense by pointing out what science is doing in the present moment.

In the following examples present and future orientations are also used in association with curing disease:

The revolution in genomics is not only changing the way people who carry genetic diseases have children. It is starting to make its way into everyone else's family planning, too. As the ability to analyze big data grows, doctors can now tell with much more accuracy and ease whether two people are carriers of a huge catalog of genetic diseases before the couple starts trying to have a child. For those who test positive, in vitro fertilization and improved techniques for screening embryos can minimize a couple's chances of having a child with inherited diseases (Wallace, 2017, para. 1 & 2).

The following story is about developments within the scientific community as a whole, but goes on to home in on Crispr in particular:

There are many who believe society has “summoned the demon” through technologies that threaten to addict us to screens and games and make us more susceptible to cyber-snoops and replaceable by machines. Those dangers and more are possible, of course, if the same society that creates technologies fails to remember the purpose for doing so - helping people to lead better lives. In 2018, the pace of tech innovation will accelerate in areas where once-fanciful ideas are becoming integral to commerce, health, entertainment, security, learning, energy, manufacturing and more. Here are a few trends to watch:...CRISPR — Another acronym, it's shorthand for a scientific technique that can be used to modify DNA in plants, animals and humans to better protect genes from bacteria and disease. It's the next step in genetic editing...Such therapies don't work for everyone and they may not last forever, but the head of the National Institutes of Health

believes a revolution is at hand. Future applications may include hemophilia, sickle cells and muscular dystrophy (Still, 2017, para. 2).

Finally, here is an example:

Summit on gene editing examines technology that makes changes heritable  
Genetic engineering isn't new, but CRISPR is, and it's a stunningly fast, flexible, cheap way to manipulate the code of life. It's so revolutionary - and unnerving - that hundreds of scientists and policymakers are gathered in Washington for a three-day summit on the implications of the technology. Developed in the past four years, the CRISPR technique exploits a natural process used by bacteria to defend against invasive viruses. Its low cost enables ordinary scientists - just about anyone with a modern laboratory and the right skills - to alter specific genes within plants and animals and make those changes heritable. This kind of gene editing could potentially be used in gene therapies targeting a variety of devastating diseases (Achenbach, 2015, para. 1-4).

Besides being present and future-oriented, the common thread throughout these examples is that they all associated Crispr with its potential to cure diseases. That is, journalists further legitimized scientific power by suggesting that it was only a matter of time for the scientific process to enable Crispr as a primary disease-curing method. Crispr's potential to cure disease was also written about in the past tense. These stories generally broke news about Crispr's developments and were only one or two days old.

**Breaking crispr.** A story breaking Temple University's progress toward curing AIDS covers the developments in the past tense:

Temple University researchers have used state-of-the-art molecular scissors to cut out dormant HIV hiding in human cells, fueling hopes for curing - not just suppressing - the insidious infection that causes AIDS. The HIV removal experiment was conducted in cells in the lab, and the scissors did not work on every cell, so the approach is a long way from use in the clinic (McCullough, 2014, para. 1).

Similar leads and nut paragraphs were prevalent throughout the coverage:

- Using a powerful gene-editing technique, scientists have rid human embryos of a mutation that causes an inherited form of heart disease often deadly to healthy young athletes and adults in their prime. The experiment marks the first time that scientists have altered the human genome to ensure a disease-causing mutation would disappear not only from the DNA of the subject on which it's performed, but from the genes of his or her progeny as well (Healy, 2017, para. 1 & 2).
- Scientists for the first time have tried editing a gene inside the body in a bold attempt to permanently change a person's DNA to cure a disease. The experiment was done Monday in California on 44-year-old Brian Madeux. Through an IV, he received billions of copies of a corrective gene and a genetic tool to cut his DNA in a precise spot.

**Summary.** This section answered RQ1.d: How was the relationship to time constructed throughout news about Crispr in institutional newspapers from 2014-2017? In Koljonen's (2013) model, the first dimension focuses on whether journalists orientate toward the past, present, or future and the second dimension focuses on how journalists manage time. Analysis regarding the second dimension was beyond the scope of this

analysis and there were mixed results concerning the first dimension. The standard narrative of change suggests that in the shift from high modern to liquid journalism, journalism has shifted its focus from the past to the present and future. But these findings did not fall into these categories, which concurs with Koljonen's (2013) point that journalistic change is not as straight forward as the standard narrative of change suggests. Given that these findings did not fall into the categories presented in Koljonen's (2013) model, this analysis categorized time-related elements of the text according to the presentism-eternalism dimension. Adherence to presentism refers to journalists' exclusive focus on subjects and topics that exist in the present, whereas adherence to eternalism refers journalistic focus on subjects and topics that span the past, present, and future (Markosian, 2016).

Journalists' adherence to eternalism is related to the high modern conception of knowledge and power. In their commitment to educating the audience, journalists are charged with properly contextualizing scientific developments and anticipating new ones. In this particular study, as journalists discussed Crispr by alluding to the past, present, and future, they did not frame the power of science as being restricted to the present moment, rather, scientific potential and power was framed as spanning the past, present and future.

## **Ethics**

This section answers RQ1.e: What was the ethical approach taken by journalists throughout news about Crispr in institutional newspapers from 2014-2017? The two dimensions in Koljonen's model are consequentialist-deontological and universal-relativistic. It is assumed that during the high modern period deontological and

universalistic ethics guided journalistic work: journalists were committed to seeking the right course of action regardless of the consequences that could result from their reporting, and they were committed to common ethical rules regardless of the context in which they were doing their work. The assumption is made on the basis that commitment to other values and orientations characteristic of the high modern period, namely objectivity, aligned with the tenets of deontological and universalistic ethics. In contrast, the supposed liquid modern journalistic ethos is consequentialist and relativistic: it is assumed that journalists prefer achieving positive effects, even at the expense of what is true and right, and that journalists choose instead to honor and act according to the uniqueness of every situation and individual judgment. Again, this assumption is made on the basis that these ethics align with liquid-era values such as subjectivity.

Journalists' constant allusions to the possibility of designer babies was what most lent itself to addressing the deontological–consequentialist dimension. But given the nature of textual analysis, this section is limited in its ability to comment on the universal-relativistic dimension. Without interviewing journalists, it is not possible to comment adequately on how they understand and apply professional ethical rules. Notwithstanding, ethical questions were threaded throughout the coverage, and some insights can be gleaned about how journalists navigate ethical dilemmas. The prevailing ethical dilemma that journalists covering Crispr engaged revolved around the question of whether humans cast into the role of God through germline editing. As one of the most contentious questions in the world, it has been a wellspring of ethical, religious and philosophical thought.

**Deontological and consequentialist ethics.** A key distinction between regular

and science journalism is that regular journalism is primarily about things that are happening. More specifically, regular journalism is usually about *bad* things that are happening (Craft & Davis, 2016). Breaking news does not usually break from a region free of war, disease, crime, and disaster. This trend in journalism undoubtedly contributes to the common perception that the world is getting worse, when in fact, it is progressively getting better (see e.g. Pinker, 2018). In contrast, science journalism generally reports about the good things science is doing; its breakthroughs and its potential. But a common thread in both forms of journalism is the desire to increase readership. Furthermore, the desire to increase readership exists alongside the duty of telling the truth. And sometimes these two commitments conflict. Broadly speaking, journalists covering Crispr assumed consequentialist ethics by deviating from their truth-telling duty and alluding to the dystopian prospect of designer babies. More specifically, their ethical approach was an offshoot of consequentialism: ethical egoism (see e.g., Shaver, 2017). Their approach was ethical egoism in the sense that their allusions to designer babies were at the beginning of stories and were made in terms of Crispr's ability to increase IQ and beauty. The sensational effect of these headlines, leads and nut graphs suggests journalists' main aim was to attract readership. This was especially evident as the stories progressed because journalists eventually came around to make it clear that science is actually a long way away from being able to design a baby. Ultimately, this suggested that journalists were primarily committed to the truth and deontological ethics.

Initially, the coverage made it seem like it was possible for science to genetically engineer a baby through headlines such as “Building a Better Baby,” “Designing the perfect baby,” and “Has gene editing gone too far?” Using words such as “building” and

“designing” in relation to a baby were intended to inspire surprise in readers. However, these words were also effective because they are familiar: most people have shared in the experience of bringing something into existence, be it something small such as a bracelet, or something big such as a house. Indeed, “building” and “designing” are usually reserved to describe the calculated effort to manipulate the physical world in convenient ways. Humans, much less babies, are not generally regarded as something that can be designed or built. Furthermore, these headlines did not set up the prospect of building or designing normal babies. They suggested to the reader that science has brought humanity to the brink of building the *ideal* baby. The use of a rhetorical question in the third headline has a twofold effect: it suggests that gene-editing technologies have in fact crossed an ethical boundary, which invites readers who are unfamiliar with the subject to read the full story.

The possibility of designer babies was further established in the body of the news stories. A lead in one story opens: “It’s a scenario that has haunted biologists since the dawn of the DNA age: the evil scientist custom-crafting a human with test tubes and petri-dishes” (Brown, 2015, para.1). After introducing Crispr, the journalist adds that it “makes genetic manipulations that were theoretical in the past seem easy to achieve — and soon” (Brown, 2015, para. 3). The journalist invokes the mad scientist trope, embodied best in Victor Frankenstein, Mary Shelly’s main character in the novel *Frankenstein*: “So much has been done — more, far more, will I achieve: treading in the steps already marked, I will pioneer a new way, explore unknown powers, and unfold to the world the deepest mysteries of creation...” (Shelly, 2018, p. 46). Invoking this trope suggests that Crispr is not only a new way to explore, but also a new way forward in

genetic engineering that will likely actualize designer babies. This sentiment is found elsewhere, where a journalist informs readers that U.S. researchers have “transformed biology by designing a cheap, fast, precise and powerful way to ‘edit’ DNA, creating the prospects of a future with less sickness, more food — and perhaps perfect babies” (Krieger, 2015, para 1). Although the journalist hedges the possibility of perfect babies, at once Crispr’s revolutionary effects on biology are also invoked and are described as powerful, fast, cheap, and precise, thus establishing optimism about the possibility to design a perfect baby. Their allusions to designer, “ideal,” or “perfect” babies in terms of improvements in IQ and beauty further sensationalized headlines, leads and nut graphs, namely because these developments are happening in the context of wariness toward genetic discourse. The wariness toward public discourse about genetics stems from its historical relationship with eugenics.

Regarding IQ, quantitative psychology has made significant contributions to the understanding of mental capacities and processes, but its research into intelligence has often times been controversial. Early on, precursors to the modern-day IQ test simply assigned a number to a person’s reasoning ability and educators received such tests as a methodological achievement that could help them identify children in need of alternative education (Roige, 2014). But the ability to assign numbers to a person’s ability to reason also facilitated the eugenics movement of the 1920s and 30s. The American Eugenics Society and similar groups formed during the movement. Members gave public presentations, went to examination buildings, and held competitions called “fitter family” and “better baby” (Remsberg, 2011; Rivard, 2014). The movement also manifested itself in media. There were posters with titles such as “Only Healthy Seeds Must be Grown:

Check the Seeds of Heredity Disease and Unfitness by Eugenics,” and at one point, a 1917 film called “The Black Stork” told a true story about a doctor that convinced two parents that it was better for them to let their syphilitic baby die than to burden society with an outcast (Rivard, 2014). The doctor’s efforts were framed as heroic.

Then in 1994 psychologist Richard J. Herrnstein and political scientist Charles Murray published *The Bell Curve: Intelligence and Class Structure in American Life*. The book was not well received then, and continues to draw criticism from within and beyond academic circles. In a word, the book has been repeatedly regarded as being *racist* (see e.g. Siegel, 2017). The book was largely a restatement of biological or genetic determinism — the notion that human behavior and characteristics are genetically determined. In their extreme forms, biological determinism diametrically opposes the notion that social pressures are what determine human behavior and characteristics. Otherwise known as the nature vs. nurture debate, opposing views on the subject have long informed cultural and political debates about the nature of mankind. The coverage alluding to Crispr’s eugenic-like capabilities highlighted these highly politicized debates.

For instance, a story relaying the ease with which researchers could design babies cited a regenerative medicine expert: “We could change genes in babies. Something as simple as getting a blue-eyed baby instead of a brown-eyed baby” (as cited in Krieger, 2015, para. 8). The quote is not necessarily meant to suggest that blue eyes are more beautiful than brown eyes, but it does allude to the ease with which Crispr can be used to make aesthetic improvements. Elsewhere, a journalist is more straightforward. Foreshadowing Crispr’s potential uses, one journalist wrote that it could potentially be used to “enhance qualities like beauty or intelligence” (Wade, 2015, para 2). In these

examples, journalists' references to IQ and beauty exemplify the common observation that journalists' assumptions or what they leave out of their news stories can be as – if not more – insightful than what they actually write. Suggesting that Crispr can be used to enhance IQ and beauty was an allusion to the controversial and politically sensitive subject of eugenics.

After suggesting that designer babies are no longer a futuristic notion, however, journalists quickly proceeded to raise doubts. For instance, after elaborating on how easy it is to manipulate the “code of life” using Crispr, one reporter relayed that “many researchers argue that it is too soon, and potentially too dangerous, to tinker with the human genome in a way that is passed down to future generations” (Achenbach, 2015, para. 4). In this instance, the promise of using Crispr to design an ideal baby is lessened by pointing out that a large portion of the scientific community remains hesitant to alter the human genome in such a way that will have an effect on future generations.

Journalists were particularly keen on giving voice to concerns raised by Dr. Jennifer Doudna —Crispr's leading developer. Despite being primarily a bioengineer, Doudna began casting into the role of bioethicist after scientists began using Crispr in hundreds of labs throughout the world. “Towards the end of 2014, my unease outweighed my reluctance to step into a more public discussion...Who besides the scientists using the technique would be able to lead an open conversation about its repercussion? (Doudna, 2015, p. 470) As Crispr's leading developer, her remarks on Crispr's limits were frequently sought after by journalists.

News stories are supposed to be read the same day they are published, and headlines and leads are written to increase the likelihood of that happening. Journalists'

decision to lead stories with the notion that scientists were able to genetically engineer babies was an appeal to ethical egoism in the sense that it was an expedient move to attract and ensure readership — an outcome that was not necessarily attached to a greater good.

**Absolutist–relativistic dimension and rational ethics.** The question about mankind’s ability to be god-like was made most explicit in coverage that homed in on the use of Crispr for germ-line editing — the technique that makes edits to DNA heritable. Opposing responses to the question stem from two common understandings. The first is that a deity created mankind and the second is that mankind is simply the result of blind evolutionary forces. Generally speaking, those favoring the religious view answer the question by appealing to universal/absolutist ethics and relativistic ethics guide the evolutionary view. What follows is a brief review of both views.

In the Western world, the religious view is generally rooted in both biblical creation stories. The first is the well-known seven-day creation story in which God is said to have created the world and all of its creatures. The second story is much older, but pertains more to this discussion. In Genesis 2:4-3:24 God creates Adam from the earth and breathes life into his nostrils. God then places Adam (whose name — according to folk etymology — means “earth” or “man”) in the Garden of Eden as the progenitor of the human race. God instructs Adam to till and keep the Garden of Eden and to freely eat of all of its trees except one. God, being the measure of good and evil, commands Adam to avoid eating from the tree of the knowledge of good and evil. God proceeds to finish creation by making Eve (whose name means “to live”) from Adam’s rib. But one day Eve encounters a serpent. The serpent suggests that it is actually okay to eat from the tree of

good and evil, and that the only reason God had prohibited it was because it would open her and Adam's eyes to the knowledge of good and evil, thus making them like God. Adam and Eve eat from the tree, and as a result they lose their original holiness and condemn their descendants to a weakened nature subject to ignorance, suffering, and ultimately, death. Genesis, of course, is a theological and mystical reflection on the origin of humanity, not a scientific treatise. The moral of the story is plain: enjoy all of life's fruits, but avoid playing god unless you want to die.

The evolutionary view is rooted in Darwinian theory, which suggests that all of life is driven by natural processes — a sharp departure from the mystical story that a divine creator created all living beings separately. The theory can be summarized as follows: there are limited resources available to living organisms, there is constant competition among organisms for these resources, organisms mutate, these mutations can be inherited, some mutations increase an organism's chances of reproducing in a competitive environment, after very long periods of time, organisms that develop an advantage diverge from their progenitors and create a new species. The law of natural selection drives the entire process. This approach to understanding the origin of mankind is void of any absolutist reprimand for seeking to be godlike. Human beings simply are, and the norms that guide proper behavior are themselves the result of blind evolutionary processes that have developed to foster the species' propagation.

Ever since Darwin's theory was made public, philosophical and theological debates have tried to either highlight the incompatibility of the religious and scientific view or they have tried to reconcile the two views. The emergence of Crispr has reinvigorated the question because it grants humans themselves unprecedented godlike

control over creation: it allows humans to circumvent the slow process of natural selection. Heritable mutations that may have taken thousands of years to develop can be done in a few hours' worth of lab work. For some, casting into the role of god is an exciting prospect. Former NASA scientist turned Crispr enthusiast Josiah Zayner embodies the excitement. Widely recognized for his campaign to provide genetic engineering Crispr kits to the public, Zayner believes humanity is in the middle of a genetic revolution:

Do I wanna be big and muscly? Do I wanna — you know, my muscles have, like, high endurance? Do I want to have dark color skin or light color skin or whatever you want. I think now is the starting place of where we get to make those choices... I think this is, like, literally, a new era of human beings (as cited in CBS News, 2017).

Prior to Crispr, genetic modifications would take several years and thousands of dollars. But as Zayner's Crispr-kit campaign and remarks demonstrate, Crispr has not only made genetic modifications possible for more areas within the life sciences, but it has also made the entire process considerably faster and cheaper. Some experts further suggest that it would be unethical *not* to evolve the human body. "Even though it can be scary, even though it can be challenging," says futurist Juan Enriquez, "It is what is going to allow us to explore, live, and get to places we can't even dream of today" (Enriquez, 2016). Zayner and Enriquez's stance embodies the relativistic view because it dismisses the possibility of an absolutist reprimand for seeking to be godlike and its main concern is the propagation of the human species. But this view is contested by the religious and

absolutist view. In view of these oppositions, which view had more bearing on journalists' coverage of germ-line editing? The answer is not straightforward.

The findings in this analysis underscore the notion that journalists do not appeal exclusively to one ethical extreme. Furthermore, these findings suggest that it is possible for journalists to synthesize opposing extremes. In this instance, I argue that journalists assumed ethical rationalism — the ethical stance derived from sound and practical reasoning. This stance includes elements of universal and relativistic ethics. It starts out with universal principles such as “don't arrogate the role of god,” but is willing to break the rule if a particular set of circumstances demand it. Throughout the coverage, journalists appealed to ethical rationalism by starting out from the absolutist view that it is problematic for humans to venture into germline editing. But journalists did not go on to take a universal or relativistic position. Rather, they implicitly suggested that the appropriate course of action would depend on more evidence, which is indicative of a moral compass rooted in practical reasoning. The following analysis will illustrate. First, examples will illustrate how journalists started out from an absolutist view. Then I will provide examples to illustrate how they implemented rationalist ethics.

**Toward rationalist ethics.** As a point of contrast, the following outlying example illustrates coverage that alluded to a relativistic ethical standard surrounding germline editing:

Around the world, laws and guidelines vary widely about what kind of research is allowed on embryos, since such experiments could change the genes of future generations. Countries such as Japan, China, India and Ireland have unenforceable guidelines that restrict editing of the human genome. Germany and other countries

in Europe limit research on human embryos by law. Last year, Chinese researchers made the first attempt at modifying genes in human embryos. Their laboratory experiment didn't work. In any case, the embryos they used were never viable, or capable of developing properly in the womb (Cheng, 2016 para. 11 & 12).

By communicating that laws on embryo experimentation vary throughout the world, the journalist gets to the core of relativistic ethics: there is not absolute standard of morality. Rather, morality varies according to society, culture, and historical context. Furthermore, it was not a coincidence that China was the first country to genetically modify embryos. Along with being the world's largest irreligious country, the materialistic and evolutionary view of humanity is prevalent (see e.g., Yang, 2011). In the absence of the typically religious view on human creation, experimenting with human life has less cultural stigma attached to it.

In the following example, however, the journalist begins the story by implying that researchers have deviated from the absolutist view that humans should not genetically modify human embryos:

For the first time, scientists have altered genes in human embryos and allowed them to briefly develop. The research crosses a boundary that scientists have avoided since the dawn of genetic engineering 42 years ago. It marks the first time researchers have attempted to modify the genetic makeup of a human embryo in ways that would allow the genetic change to be passed to succeeding generations (Spotts, 2015, para. 1 & 2).

Another journalist alerted readers about the same study by writing that those within the scientific community were also concerned about the deviation from the absolutist standard. After briefly outlining Crispr's capabilities and its UC Berkeley origins, the journalist wrote:

Alarmed that their new gene-editing tool was recently used by Chinese researchers to create the first genetically modified human embryos, scientists at UC's Innovative Genomics Initiative are leading the call to urge only safe and ethical use of the tool. And they plan to hold a landmark conference to debate how to proceed (Krieger, 2015, para. 2).

Finally, in a story titled "Has gene editing gone too far? Ethical boundaries debated at historic summit," the lead communicates that some critics think Crispr is "rushing headlong into the future without considering the side-effects and ethical concerns," while the nut graph continues:

Those concerns intensified sharply last spring, when a team at China's Sun Yat-sen University altered inheritable genes in non-viable human embryos for the first time in history, such a shocking development that leading international journals Science and Nature refused to publish the research (Jackson, 2015, para. 1 & 2).

The common thread throughout these examples is that the journalists were concerned that after four decades of upholding the universal ethical standard, scientists crossed an ethical boundary by genetically modifying human embryos.

Elsewhere, journalists covering the same topic repeatedly gave reasons that explained why germline editing was a break from the universal standard. In one story, the

journalist gave reasons for upholding that universal standard by summarizing commentary laid out in the journal *Nature*:

Mistakes might occur in the editing process that could result in severe birth defects. Successful edits could affect other parts of the genome that were meant to be left alone. It's impossible to get consent from future generations who might inherit an altered gene. People could use gene editing for “non-therapeutic genetic enhancement” -- making designer babies with blue eyes and high IQs (Brown, 2015 para. 25).

Similar concerns were echoed throughout the coverage, such as in this example:

Altering genes in sperm, eggs or embryos can spread those changes to future generations, so-called “germline” engineering. But it's ethically charged because future generations couldn't consent, any long-term negative effects might not become apparent for years, and there's concern about babies designed with enhanced traits rather than to prevent disease (Neergaard, 2017, para. 11).

By communicating these concerns, journalists were communicating that there are consequences attached to playing god. The consequences ranged from the possibility to eugenics to unknown side effects and ultimately, death.

Following the Chinese-based experiments that caught the scientific community by surprise, there were several ethical summits calling for a moratorium on that kind of experimentation. These summits were also documented in the coverage. But between the Chinese experiments and the summits discussing bioengineering ethics, the experimentation continued in labs all throughout the world. Put another way, scientific capability was surpassing dialogue about the ethics of the science itself. Although the

first instance of germline editing also caught journalists off guard, later reports of similar research were covered according to a rationalist ethical standard rather than a universal one. Instead of framing the research as taboo, this coverage focused on the safety of germline editing and suggested that while controversial, more evidence was needed to make educated decisions about continuing or ending such research. Furthermore, journalists mostly underscored this point through the sources they used. The following examples will illustrate.

The shift in concern toward the safety of germline editing rather than its moral appropriateness was present in a story about the first instance in which scientists safely repaired a disease-causing gene that causes heart failure in young athletes. The research was done in a laboratory — it was not carried out on an actual pregnancy, but it demonstrated that germline editing was getting closer to actuality. Echoing expert opinion, one journalist wrote:

And lots more research is needed to tell if it's really safe, added Britain's Lovell-Badge. He and Kahn were part of a National Academy of Sciences report earlier this year that said if germline editing ever were allowed, it should be only for serious diseases with no good alternatives and done with strict oversight (Neergaard, 2017, para. 22).

About three years after China-based studies, the question about whether or not it is morally appropriate to carry out germline editing was no longer a main feature of the coverage. In terms of rational ethics, the moral question guiding the coverage was whether or not germline editing was safe. And determining its safety, of course, would be determined by more research and evidence. The following examples further illustrate:

- Much more research is needed before the method could be tested in clinical trials, currently impermissible under federal law. But if the technique is found to work safely with this and other mutations, it might help some couples who could not otherwise have healthy children (Belluck, 2017, para. 11).
- The list of criteria for going down that road is a long one, said Alta Charo, a professor of law and bioethics at the University of Wisconsin, speaking at a news conference Tuesday in Washington. For example: The intervention would have to replace the defective, disease-causing gene with a gene already common in the human species. There would also have to be no simpler alternative for parents wishing to have a healthy child. And first and foremost, there needs to be more research to show that such modifications are safe and target well- understood genes, she said (Achenbach, 2017, para. 8).
- “How bulletproof is the technology? We're just learning,” but safety tests have been very good, said Dr. Carl June, a University of Pennsylvania scientist who has done other gene therapy work but was not involved in this study (Marchione, 2017, para. 28).
- Previous embryo-editing attempts in China found not every cell was repaired, a safety concern called mosaicism. Beginning the process before fertilization avoided that problem: Until now, everybody was injecting too late, Mitalipov said (Neergaard, 2017, para. 11).

In addition to the focus on the safety concerns and the pending research that would alleviate those concerns, journalists simply echoed the conversation taking place within the scientific community. This was another way in which journalists also showed

deference to scientific authority and faith in the scientific process. Note for example that the cited experts whose ethics journalists reflected were not bioethicists. They were scientists whose work and livelihood would be affected by public policies that restrict or encourage germline editing. Furthermore, they generally communicated optimism about the possibility of alleviating any safety concerns associated the use of Crispr for germline editing.

**Summary.** To summarize, coverage about Crispr deferred to a consequentialist ethic — ethical egoism — by sensationalizing headlines that framed Crispr as the gateway to a dystopian future with designer babies. But a deontological ethic prevailed because as stories developed, journalist made Crispr’s limitations known. Regarding the aforementioned distinction between absolutist/universal ethics and relativistic ethics, and the question of whether or not humans should venture in germline editing, journalists did not address the questing by adhering strictly to one ethical approach or the other. Initial coverage started out with universal principles but edged toward a synthesis by appealing to rationalistic ethics that based the appropriateness of germline editing on its safety and its potential to cure disease. Ultimately, journalists’ adherence to deontological and rational ethics challenges the standard narrative of journalistic change, which often times exaggerates the degree of change that is taking place by suggesting that journalists increasingly consider the consequences of publishing truthful reports and adhere to relativistic ethics (see. Jaakkola et al., 2015).

### **Chapter Summary**

So far, this chapter has answered RQ 1: How did the shifting journalistic ethos affect science journalism in institutional newspapers from 2014-2017? The question was

made in view of a narrative that conceptualizes journalistic change as moving from a high modern to a liquid ethos. In science communication, the shift from a deficit to a dialogue model parallels some the wide-scale changes happening in journalism. Regardless, the underlying assumption was that as a distinctive form of journalism, science journalism is affected differently by the wide-scale changes. Furthermore, the prevailing narrative of change was bolstered, and the question was addressed according to how journalists implemented five core orientations of journalistic change: knowledge, audience, power, time, and ethics. These orientations are themselves subject to the pressures of a shift from a high to liquid modernity.

Regarding the knowledge orientation, the primary finding was the prevalence of analytical explanations over empirical explanations. While analytical explanations did not deter journalists' commitment to objectivity, it led to a stylistic shift. This shift from stenographic reporting that was typical of high modern journalism and that might be expected of science journalism was regarded as poetic journalism. Poetic journalism is to be contrasted with prosaic journalism, which *is* stenographic, assumes that facts and values can be separated neatly, and focuses solely on providing facts. Poetic journalism throughout the coverage used elements of narrative and figures of speech such as metaphor to communicate objective information about Crispr.

Analysis about the audience orientation revealed some problems with the dichotomies in Koljonen's (2013) multidimensional model. The two dimensions subject to the pressures of liquid modernity consider whether journalists perceive of the audience as active or passive and whether they perceive the audience as citizens or consumers. The model suggests that an audience perceived as active and as consumers is indicative of a

shift toward liquid journalism. But these findings problematize the model's dimensions because coverage about Crispr led to consumer-oriented coverage, but throughout that coverage, the audience was not conceptualized as active. This was especially evident in view of the lack of effort put toward building dialogue with the audience. It is possible that the shift toward poetic-style journalism is print science journalists' attempt to establish dialogue or relate to the audience. But in this analysis, journalists' use of poetic-style journalism was primarily geared toward improving the one-way flow of communication, not cultivating dialogue. The findings in this study point to a neglected element in the salient narrative of journalistic change: it is possible for science journalists to conceive of their audience as passive consumers.

Even though journalism's relationship to institutional power is usually addressed in the context of American politics, science also provides a fruitful case study, namely because science and politics are deeply related. Sometimes the preference for science-based policy and science's dictum of *following the evidence wherever it may lead* coincide in such a way that it puts science in an especially powerful position. In turn, journalism is put in a position to either seek consensus and be passive or to question power and be active. In the context of politics, the shift toward analytical reporting has been deemed as journalists' willingness to challenge those who wield power on the basis that it allows journalists to regain professional authority and lessens reliance on expert sources (see e.g., Graves, 2017). But throughout coverage about Crispr, journalists exemplified the high modern theme of relying on expert sources and mirroring expert commentary, thus rendering journalists passive observers who sought consensus by legitimizing the scientific process.

Analysis regarding the dimension that considers how journalists manage time was beyond the scope of this research. Furthermore, this analysis also revealed that the time dimensions in the time orientation are not easily applicable to science journalism. Questions about the applicability of this dimension arose because the coverage did not consistently adhere to a past, present, or future orientation. To address this problem, this study borrowed from the philosophy of time and categorized elements of the text that were time-related according to the presentism-eternalism dichotomy. Instead of focusing on whether journalists orient toward the past, present, or future, the eternalism–presentism dimension addresses whether journalists write as if the subjects they cover only exist in the present or whether they span the past, present, and future. The coverage adhered to eternalism, which was found to be indicative of the high modern commitment to educating the audience and deference to scientific power, namely because journalists framed science as a fixed source of authority regardless of the passage of time.

Finally, analysis about the ethical approach taken by journalists revealed that it is possible for journalists to synthesize opposing dimensions. This was made evident in relation to the universal–relativistic orientation and journalistic coverage devoted to germline editing. Instead of taking a strictly universal or relativistic ethical approach on whether germline editing was morally appropriate, journalists took a rationalist ethics approach. Rational ethics are a synthesis because they require starting out from a universal proposition but allow for making exceptions. In this particular study, journalists started out their coverage with the assumption that germline editing was universally wrong, but later suggested that deciding whether or not proceeding with germline editing is morally appropriate should be based on scientific evidence.

## Chapter 5: Discussion

This chapter has three aims. First, *high modern* and *liquid journalism* will be discussed in terms of their conceptual value in journalism research. Second, *narrative* will be introduced as a potential orientation for research devoted to understanding the change from a high modern to a liquid ethos. The narrative orientation is meant to help understand whether the stories journalists tell about the subjects they cover conform to a high modern or liquid ethos. Science journalism and the findings from this study will serve as a case study and utopia and dystopia will be introduced as the opposing dimensions of the narrative orientation. It will be suggested that a utopian narrative aligns with the high modern ethos and that a dystopian narrative aligns with a liquid ethos. The third aim of this chapter is to interpret the findings. That is, this chapter will address what news coverage about Crispr reveals about the current journalistic ethos (RQ 2). In addition, a potential explanation for these findings will be offered. The explanation will introduce the concept of *interregnum* and explicate the philosophical principles of high modern and liquid modernity. It will be argued that journalism is currently undergoing an interregnum — an in-between phase — and that its commitment to being society's primary sense-making practice is in opposition to the philosophical principles of liquid modernity. That opposition is what keeps journalism from fully assuming a liquid ethos.

### **High modern and liquid journalism: conceptual merits**

A narrative of change built around the concepts of high modern and liquid journalism is not the only scholarly trend seeking to make sense of the changes taking place in journalism. Fruitful scholarship addressing journalistic change has approached

the subject in terms of a paradigm shift (Bennett et al., 1985; Coddington, 2012), while others have addressed the changes in journalism in terms of questions surrounding journalism's legitimacy (Carlson, 2016; Tong, 2018). Regarding science communication, literature has conceptualized broad-scale change in terms of a shift from a deficit to a dialogue model (Bucchi & Trench, 2014; Sturgis & Allum, 2004). The question then becomes: what do the concepts of high modern and liquid journalism contribute to similar scholarly trends? To address the question, it is important to note that the common denominator in these threads of research is that they too build distinctive narratives to address the onset of journalism's broad-scale changes. And any narrative that explains "social or institutional change becomes strong not only because it captures something essential about change, but also because it serves the 'interests' of several stakeholders" (Koljonen, 2013, p. 150). For instance, the narrative of a paradigm shift in journalism makes journalists aware that their work lacks a sense of coherence and it informs journalism's commercial interests about the fragmentation of audiences. The following paragraphs will briefly address why the concepts of high modern and liquid journalism — and the narrative they are imbedded in — are worthwhile conceptual tools that capture something essential about change.

Understood in their ideal-typical forms, high modern and liquid journalism play an integral part in understanding journalism's broad-scale changes. An ideal-typical understanding (see e.g., Andreski, 1964) of these concepts is important because to some extent, these concepts are hypothetical; high modern and liquid journalism have not existed in pure forms across all platforms and areas of journalism. As part of a broader narrative of change, their conceptual merit is that they help analyze the potential onset of

a new era of journalism; they can be used to investigate an emerging trend within journalism as well as specific instances of that trend. Ideal-typical characteristics of the emerging trend include a style of journalism that is skeptical toward once stable conceptual categories such as objectivity, and the emergence of new news values like transparency, which grants journalists the opportunity to be up-front about their subjectivity. Both concepts and the narrative they are imbedded in, however, are bolstered and set apart from other theoretical concepts when they are understood in terms of the five orientations of journalistic change presented in Koljonen's (2013) model. When high modern and liquid journalism are understood in reference to knowledge, audience, power, time, and ethics, they offer a powerful framework to properly situate the current state of journalism because these concepts synthesize or account for other concepts addressing journalistic change, such as paradigm shift and legitimacy, and the narratives they are imbedded in.

Regarding the merits of these concepts in science communication, there is significant overlap between the narrative suggesting a shift from a deficit to a dialogue model, and the high modern to liquid narrative that is usually applied to general journalism. The overlap is especially evident in how both narratives account for the changing relationships that journalists have with their audience and how the knowledge orientation is perceived. According to both the high modern ethos and the deficit model, the guiding assumption is that there is a substantial gap in knowledge between experts and the average citizen, and that it is journalists' job to fill that gap. Similarly, according to the liquid ethos and the dialogue model, there is the assumption that the average citizen has gone from being a spectator to being an active participant, which shifts journalists'

role from being mediators of complex information to being collaborators with both experts and the audience.

Understood in terms of the deficit and dialogue models, the findings in this study suggest that a deficit model prevailed in institutional news coverage about Crispr from 2014-2017. The deficit and dialogue models, however, do not directly account for other elements of the journalistic ethos: power, time, and ethics. Even though some of the findings in this study suggest that orientations such as time do not map neatly onto science journalism, the deficit and dialogue models could be improved upon and lead to more insights about science journalism should it incorporate other journalistic orientations. To be sure, these orientations provide a thorough framework, but they are not exhaustive. Hence, the following section offers an additional orientation that could potentially help map change in general journalism, but the dimensions provided are geared specifically for mapping change in science journalism.

### **Narrative as an Orientation of Change in Science Journalism**

The orientations that have guided this study originate from an extensive body of research devoted to categorizing journalism's ethos or occupational ideology (Carpentier, 2005; Deuze, 2005; Hanitzch, 2007; Koljonen, 2013). Knowledge, audience, power, time, and ethics have been found to be the main "constituents," "fields," "ideal-typical values," "ingredients," or "nodal points," that define journalism's ethos in Western democracies (Carpentier, 2005; Deuze, 2005; Hanitzch, 2007; Koljonen, 2013). The assumption has been that these orientations are subject to transformation as a result of the shift from a high to a liquid ethos. Although these orientations undoubtedly shape how journalists go about their work, they do not directly address journalists' final product — the stories they

tell. The argument made here is that journalists' most basic job is to tell stories about the world, and that the subjects journalists cover in their stories are themselves subject to interpretation through a high modern or liquid ethos. Hence, discerning whether journalists frame their subjects according to a high modern or liquid ethos can further help explain journalistic change. With the findings in this study as a frame of reference, narrative will refer to the way journalists represent the relationship between science and society. The primary dimension concerning science journalism and narrative is stretched between utopia and dystopia.

**Utopia.** There is an obvious objection to the association of a utopian narrative with the high modern ethos, namely, utopian narratives are future oriented, and according to Koljonen's (2013) conceptualization of the time orientation, being oriented toward the future is indicative of a liquid ethos. But as the findings suggest, Koljonen's associations between the time orientation and liquid and high modernity are not always conducive to getting a grasp on how journalists construct their relationship to time. In any case, the main reason utopian narratives align with the high modern ethos is that they both integrate rationalism. Rationalism in this context refers to the doctrine that humans' ability to reason can be used to solve humanity's problems and to master the natural world to make conditions more conducive to human flourishing (see e.g. Ehrenfeld, 1981). Rationalism's natural corollaries are science and technology — the main tools it uses to ensure human happiness and flourishing. Hence, rationalism makes science and the knowledge it produces the ultimate end; the natural world becomes subject to the methods of science and natural laws are instituted according to scientific evidence.

The classical utopian narrative that illustrates the incorporation of rationalism is Thomas More's *Utopia* (1516). In *Utopia*, world traveler Raphael Hythloday tells the story of a manmade island called Utopia. His detailed account touches on a range of Utopia's characteristics: its system of government, its economy, and its guiding philosophies regarding social institutions, including science. Regarding its government and economy, a socialist ethic ruled in Utopia. Its inhabitants preferred to work the land rather than turning it into a private enterprise. They also took turns farming it, which eliminated class distinctions. After giving every child a thorough education, people were free to choose their vocation, and all were trained according to the trade or intellectual pursuit that suited them most and that they would be likely to excel in. This created conditions in which most people used their leisure time to entertain intellectual problems. Everyone was well-versed in various disciplines and were not held back by superstition. Although various religions co-existed, it was Utopians' adeptness to rationalism that afforded them to manage their society with high levels of efficiency.

Since More's publication of *Utopia*, utopian narratives generally frame rationalism and science as the enterprise that will see society through its problems (see e.g., Mårtensson, 1991). But rationalism has been a guiding doctrine in the real world as well. For instance, the underpinning of the high modern ethos was also rationalism. Conditions in the Western world during the period of high modernity were far from the conditions in Utopia, but ideas of progress and faith in the perfectibility of society also characterized high modernism, and by and large, these ideas delivered on their promise. Scientific developments improved the human condition substantially regarding poverty, hunger, wealth, peace, and health during high modernity (Pinker, 2018).

In the context of science journalism, there have been critiques about journalistic narratives that place too much emphasis on the promise of science. For instance, journalists have been found to portray scientists as athletes engaged in competition for highly sought-after awards such as the Nobel Prize (Nelkin, 1995). Such portrayals idealize scientists as being socially removed and superior to other members of society. Furthermore, scientific practice is idealized as an “esoteric activity, a separate culture, a profession apart from and above other human endeavors” (Nelkin, 1995, p. 30). One problem with these accounts is that they ignore the research process and questions about scientific risk and uncertainty. This leads some journalists covering science to present scientific *correlation as causation*, which makes science seem more solid than it actually is (Murray et al., 2001). Combined, these trends in the way science is covered portray science as the ultimate key to societal progress.

Throughout news coverage about Crispr, a utopian narrative about science and its relationship to society was especially present in relation to the power, ethics, and audience orientation. For instance, journalists’ deference to expert sources, their legitimization of the scientific process, their application of rationalistic ethics, and their commitment to educating the audience about Crispr, all contributed to a narrative that framed science as run by infallible people, as society’s most extolled institution, and as the means to human flourishing and happiness. Although Crispr’s limitations were threaded throughout the coverage, the coverage also reiterated Crispr was only in its beginning stages, and as the coverage developed, it increasingly focused on Crispr’s success stories and potential rather than the ethical debates that surged when it first became popular. As such, Crispr, was portrayed as the latest offspring of rationalism; a

technology resulting from humans' ability to reason and geared toward ensuring human flourishing. Crispr's promise was not simply to treat disease, it was to eliminate disease once and for all from the human genome.

**Dystopia.** Jonathan Swift's *Gulliver's Travels* (1726) features several classical examples of the dystopian narrative. For instance, in part three of the novel the main character, Lemuel Gulliver, is abandoned at sea in a small boat with little food, but he finds some islands and goes ashore. After setting up camp he notices that a floating island is blocking out the sun, and that the island is inhabited. The people lower the island and send down a chain for Gulliver to get onboard. The island is a perfect circle and its astronomers use magnetism to move the island at will. Upon acclimating himself, Gulliver notices the island's inhabitants are odd in dress and mannerisms. The people proceed to introduce him to the island's king, who is in deep meditation at a table covered with mathematical instruments. Unable to speak the same language, Gulliver is given instruction. The language on the floating island is rooted in the theoretical principles of math and music because the island's leadership place high importance on these principles. Furthermore, unlike More's *Utopia*, Swift's *Laputa* features class divisions. The ruling class is highly educated regarding theoretical knowledge but lacks practical knowledge, while the rest of the population are servants. The ruling class entertains theoretical thinking so much that one of the primary duties of the servant class is to constantly strike ruling class members so that they can carry on with everyday life. The ruling class is struck frequently enough that one of their eyes points up and the other points down, which, according to most interpretations, is indicative of the telescope and microscope (Higgins, n.d.; Lynall, 2012).

Swift's satire of Enlightenment rationalism in *Gulliver's Travels* served as a guide for future stories featuring a dystopian narrative. The narrative has become especially common in the science fiction genre, which is exemplified in Aldous Huxley's 1932 *A Brave New World* and the 1997 film *GATTACA*. In both works the consequences of the ability to genetically engineer humans are elaborated on in great detail. A unifying theme in both works is social stratification. Like the social organization in Laputa, inhabitants in World State and the "not-too-distant future" — respective settings of *A Brave New World* and *GATTACA* — a "superior" class rules over an "inferior" class. But overall, the main message in dystopian narratives is that rationalism is not necessarily a sure-fire way to create a flourishing society. The dystopian narrative ultimately concludes that overreliance on rationalism is self-defeating and can have damning effects on society.

Both dystopian narratives and the liquid ethos share in the dissolution of rationalism. The dissolution of rationalism is part of the liquid ethos in the sense that a liquid ethos values flexibility and thrives in the face of uncertainty. Whereas high modernity's rationalism favored stability, certainty, and sought to perfect institutions in order to establish order and achieve predictability, in liquid modernity, predictability is a hindrance (Bauman, 2015). In liquid modernity, institutions and individuals derive value and power from having the potential to reinvent themselves in the future. Hence, in liquid modernity, the retreat from rationalistic methods and preference for flexibility also leads to the topsy-turviness present in dystopian narratives. Currently, there is no shortage of real-world and dystopian-like examples that illustrate the preference for flexibility and rationalism gone astray. For instance, operators in remote areas of the American west have command over unmanned drones in the Middle East that can kill hundreds of people

with a single strike and mass surveillance relies on technology rather than manpower. But one area where the preference for flexibility is especially present is bioengineering, where features that were once bound to humans' genetic makeup can increasingly be altered at will.

Not surprisingly, then, the dystopian narrative has also been discussed in scholarship devoted to science journalism. While scientists are often presented as the paragons of rationalism, and science as the key to human flourishing, science journalism also tells of the dangers of science and the potential for scientific advancements to be in the wrong hands. These stories tell of mad scientists driven by greed and willing to exploit scientific knowledge for menacing purposes (Allan, 2002). These stories prevail in news coverage about biotechnology and bioengineering, where the question of what it means to be a human being is central. For instance, news coverage about gene-editing, cloning, and robots typically feature how the pursuit of scientific discovery can have dire consequences (Allan, 2002). Throughout such news coverage journalists commonly exploit the *Frankenstein* "frame" or "script," and Aldous Huxley's *Brave New World* to advance different visions of biological science (Turney, 1998). In some cases, such news coverage suggests scientists are dangerous and must be monitored (Mulkay, 1997). Failure to monitor scientists implies the possibility that society can spiral into a dystopian nightmare. Throughout news coverage about Crispr, a dystopian narrative about science and its relationship to society was present in coverage that highlighted Crispr's potential use for designer babies. Although allusions to designer babies were seemingly a ploy to attract readership, those portions of the news coverage contributed to a narrative that

framed science as potentially run by unethical people and as the means for certain people within society to accumulate power.

**Summary.** This section introduced *narrative* as an orientation for research devoted to understanding journalistic change. Like knowledge, audience, power, time, and ethics, the narrative orientation is also subject to transformations resulting from the shift from a high to a liquid ethos. The narrative orientation particularly helps to understand if the subjects and events that journalists cover in their stories are framed according to a high modern or liquid ethos. Science journalism served as an example and utopia and dystopia were introduced as the opposing dimensions of the narrative orientation. It was suggested that a utopian narrative aligns with the high modern ethos because both exemplify reliance on rationalism. In opposition, it was suggested that dystopian narratives align with a liquid ethos because both feature the dissolution of rationalism.

### **The Current Journalistic Ethos: Interregnum**

This section addresses what news coverage about Crispr reveals about the current journalistic ethos (RQ 2). One of the defining characteristics of society's shift from a high modern to a liquid ethos is that uncertainty is currently the only certainty. The push and pull between a high modern and liquid ethos is felt across various social institutions, from politics to the family structure and from the education system to the news media. A fruitful way to conceptualize the uncertainty and the lack of a prevalent ethos in society is to consider the present state an *interregnum* — an in between stage. One observation that can be gleaned from this study is that journalism is also going through an interregnum; it has not undergone a wholesale shift from a high modern to a liquid ethos. There are

holdouts, exemplified in the way science journalism was implemented in institutional newspapers over the last three years. Hence, the argument made here is that like society, journalism itself is going through an interregnum and that journalism's function as society's primary sense-making practice is what prevents it from fully assuming the philosophical elements of a liquid ethos.

**Society's interregnum.** When Zygmunt Bauman introduced the concept of liquid modernity in 2001, he illustrated his thesis by using emancipation, individuality, time/space, work, and community as conceptual case studies. In addition, he touched on the material elements of a shift in power relations, the dissolution of social bonds, a change in the structure of economic systems, and regarding philosophy and ethics, he talked about the short supply of "stable orientation points." When Bauman made his argument, he did not suggest that liquid modernity had seized the day. He simply outlined its characteristics, bearing in mind that an old way of doing things lingered. This section will briefly present two additional conceptual case studies to illustrate how society's shift from high to liquid modernity is best understood in terms of an interregnum. The first case is about the push and pull between nation states' use of soft and hard power and the second one is about the coexistence of nationalism and globalization. Both cases will be discussed in the context of developments in the U.S.

The concept of interregnum has traditionally referred to the periods of time between the end of one government and the succeeding government. Historically, the longer the period of time between governments or ruling powers, the more that period of time has been marked by civil unrest and uncertainty. Roman historian Titus Livius (Livy) first introduced the concept to interpret the period of time immediately following

the death of Rome's legendary founder — Romulus (see e.g. Bauman, 2012). In view of the life expectancy in ancient times, most people subject to Romulus had only known one king, which especially shrouded the period of time that followed his death with unrest and uncertainty. The concept was briefly brought to life centuries later, when Italian thinker Antonio Gramsci famously wrote that “the crisis consists precisely in the fact that the old is dying and the new cannot be reborn: in this interregnum, morbid phenomena of the most varied kind come to pass” (Gramsci, 1992, p. 33). This thought is in his *Prison Books*, which, as the title suggests, was written while he was incarcerated. During an interregnum, the old way of doing things are no longer effective and the new way of doing things is not invented yet (see e.g. Bauman, 2012). An interregnum challenges the adage that “to know where you are going, you must know where you come from” because during an interregnum, society knows where it comes from, but at best, its plans for the future are on the drawing board.

The current interregnum can be illustrated through the present state of power and politics. Power and politics are intimately related. Power refers to the ability to do things and politics is simply the ability to decide which things should be done and which should be avoided (Bauman, 2015). Changes in the way power has been implemented in recent years is indicative of society's interregnum because the old way of executing power, while ceding territory to new forms, has not completely disappeared. Instead, there are currently two competing methods to execute power (see e.g. Nye, 2005). The thesis outlining the change between the two competing methods can be summarized as follows: For most of the 20th century political power was concentrated in the U.S. and Soviet Russia. Following the fall of the Berlin Wall in 1989 the U.S. became the world's

undisputed dominant power for the decade of the '90s. But after the 9/11 terrorist attacks it became evident that U.S. power was not as effective as it once had been. At best, U.S. involvement in the Middle East has not been swift. At worst, its involvement has mostly resulted in failures. This has happened despite a superior military. Economically, global powers such as Brazil and China began to rise while the U.S. experienced its worst economic collapse since the Great Depression (see e.g. Bauman, 2015).

Post 9/11 it became clear that the style of power that shaped much of the 20<sup>th</sup> century had lost its effectiveness. Twentieth century power tactics are considered *hard* power, to be contrasted with *soft* power (Nye, 2005). Hard power manifests through military and economic coercion. The use of hard power by a dominant nation state puts a weaker nation state in a position where they have to accept inferior terms of service — so to speak — because the alternative would lead to military or harsher economic reprimands. Soft power has surged as the means by which nation states can influence or direct other nation states to act in a certain way. Soft power works by building alliances rather than defeating enemies. To illustrate, in terms of hard power, the U.S. accomplished many of its military endeavors early on in the Middle East, namely the removal of Saddam Hussein from power. In terms of soft power, however, the U.S. antagonized most of the Islamic world, which has rendered a powerful military and other hard power tactics ineffective. Recent American relations with North Korea exemplify the concomitant use of hard and soft power. On the one hand, the U.S. is seeking diplomacy instead military force, which is indicative of soft power. On the other hand, the threat of harsh U.S. economic sanctions has arguably contributed to the conciliatory tone that seems to be prevailing. Instead of dominating, soft power diplomacy seduces,

much like in consumer markets product producers try to seduce audiences through various advertising techniques (see e.g. Nye, 2005).

The ongoing push and pull between nationalism and globalism are also indicative of society's interregnum. The push and pull are best understood in light of the effects that Enlightenment principles have had. Simply stated, Enlightenment principles have led to wide-scale prosperity and peace, and wide-scale prosperity and peace have changed values, minds, and cultures toward a globalist ethic (Haidt, 2016). The argument that Enlightenment principles have drastically improved the quality of life is well-established and is usually based on GDP trends (Norber, 2016; Pinker, 2018). According to detailed longitudinal research on the effects of GDP growth, as societies move from agriculture-based economies to industry-based economies, they undergo a parallel shift from traditional to secular rational values (Haidt, 2016). The trend can be neatly summarized as follows: "Fading existential pressures open people's minds, making them prioritize freedom over security, autonomy over authority, diversity over uniformity, and creativity over discipline" (Welzel, 2010, p. xxiii). These trends have especially led to a globalist ethic among cosmopolitan elite, a section of the population that orients toward progressive values. For instance, in the U.S., survey data asking about the use of the word "we" in relation to community, nation, and world, suggests that progressives tend to be more concerned with people from all around the world and sometimes disdain nationalism. In contrast, conservatives — who tend to also be nationalists — are more prone than progressives to use "we" in relation to community and nation (Haidt, 2016).

The coexistence of nationalism and globalization has been referred to as *cosmopolitanization*: internal globalization; globalization from within the nation state

(Beck, 2002). Cosmopolitanization transforms everyday consciousness and identities significantly as global issues become “part of the everyday local experiences and the ‘moral life-worlds’ of the people” (Beck, 2002, p. 17). Trends in immigration underscore the co-existence of nationalism and globalism. Given that societies that embody Enlightenment principles have historically experienced mass immigration, the push and pull between nationalism and globalism plays out in the cultural and political wars about the merits immigration. For instance, regarding the infamous notion of a border wall, borders are an anathema to the globalist ethic, whereas a nationalist ethic suggests that borders are the primary requisite for having a nation.

Society’s interregnum is felt across various domains. Both of these conceptual studies, in addition to Bauman’s use of emancipation, individuality, time/space, work, and community, underscore that society is in an in-between stage. The old methods and categories linger as new ways and ideas gain territory. But there has not been a change toward a modernity that is purely liquid.

**Journalism’s interregnum.** As society’s primary sense-making practice, journalism both reflects and contributes to what is happening in society (see e.g., Christians et al., 2010; Hartley, 2000). This study is indicative of the way in which journalism reflects the current state of interregnum because it demonstrates that the grand narrative of journalistic change has not been completely fulfilled — a liquid journalistic ethos has not crystalized as journalism’s primary ethos. Like society, journalism itself is in an in-between stage. The nature of journalism’s interregnum is hard to pin down. In view of the five orientations that guide journalism, the interregnum involves a dialectic process where high modern and liquid categories are conceptually integrated.

Journalism's interregnum indirectly or directly shapes the ethos of journalists; liquid modern categories flow in and out of the journalistic consciousness. Any given event or subject that journalists engage is subject to the interconnectedness of high modern and liquid categories. Some subjects are more prone to be treated according to one ethos over another. For example, journalists covering subjects related to cultural phenomena are prone to adhere to a liquid ethos — they are generalists seeking to entertain readers, rely less on experts from the artistic field, they see themselves as reporters appreciating previewing, and rather than representing the art world within the media, cultural reporters relying on a liquid ethos and are representatives of the media in the art world (Jaakkola et al., 2015). In contrast, journalists covering subjects related to science are prone to adhere to a high modern ethos — they seek to educate their audience, rely on experts from the scientific field, and they see themselves as gatekeepers of technical information.

But as society's primary sense-making practice, journalism is one of the primary institutions engaged in the effort to alleviate many of the uncertainties that shroud contemporary society. For instance, throughout news coverage of Crispr, journalists were committed to high modern conceptions of knowledge and audience, which resulted in educational content that had the potential to lessen uncertainties about Crispr. Put another way, journalists were able to alleviate uncertainties about Crispr by keeping the philosophical elements of a liquid ethos at bay. Arguably, the philosophical elements of a liquid ethos were kept at bay because they were not suitable for allowing journalism to function as society's primary sense-making practice. At this point, elaborating on the distinction between the material and philosophical elements of the journalistic ethos will help bring the argument into focus.

As noted in the onset, journalism's material and philosophical elements contribute to its ethos. Its material elements simply refer to the apparatuses that allow journalism to function as it does. These include anything from satellites to optical fiber and TVs to computer monitors. In the context of the narrative of change from a high modern to liquid ethos, the most noticeable change that has taken place regarding journalism's tangibles is its shift from a static offline platform to one that is fluid and online. Another way to illustrate the distinction is to think of the journalistic ethos as being divided and affected by hardware and software. The shift from offline to online platforms mostly pertains to changes in journalism's hardware. The focus in this study has been on the software; the philosophical, intangible and conceptual elements that shape the journalistic ethos. For example, the way journalists implement, relate to, or construct their relationship to knowledge, audience, power, time and ethics are all philosophical elements that shape the journalistic ethos. Furthermore, these orientations are subject to the broad-scale push and pull between high modern and liquid ethos. But what exactly is at the core the high modern and liquid ethos?

It is suggested here that the doctrines of realism and nominalism are at the philosophical core of the high modern and liquid ethos, respectively. Although Bauman does not directly address these doctrines in *Liquid Modernity*, he alluded to the distinction between the two when he invoked Ulrich Beck's (2002) concept of zombie categories because the push pull between realism and nominalism creates the ideal conditions for zombie categories. For example, belief in journalistic objectivity demands adherence to realism, but to some extent, journalistic objectivity has become a zombie category because in some areas of journalism a nominalist view of objectivity has

prevailed. Realism and nominalism will be elaborated on in order to further argue why the former, should it be integrated into journalism's primary ethos, would render journalism incapable of functioning as society's primary sense-making practice.

Realism can best be understood according to its ontological and epistemological dimensions. Ontologically, realism refers to the acceptance of objective things or categories such as such as knowledge, truth, and morality. Epistemologically, realism refers to the acceptance that we can attain knowledge about those objective categories or things (see e.g. Maritain, 1995). As the most fundamental doctrine of the high modern ethos, realism is deeply related to the tradition of Western rationalism, which can be briefly summarized as the supposition that

a world exists 'out there', independently of the ideas about it that any particular scholar or scientist may hold; that it is possible to use language in order to make statements about this world that may be regarded as being true in the degree to which they accurately represent or 'correspond to' it; and that the attempt to determine their truth, or otherwise, can be carried out through various procedures grounded in a generally valid logic governing the linkage of evidence and argument (Goldthrope, 2000, p. 8).

Realism sides with the notion that abstractions are rooted in objective reality, and that language is a reliable device to know that reality. To further illustrate how the high modern ethos is rooted in realism, it is helpful to consider how journalists covering Crispr situated themselves in relationship to scientific power. When journalists legitimized the scientific process, they underscored the realist view of reality because the scientific

process itself rests on realism's core suppositions: that there is objective reality and that it can be known.

Nominalism opposes realism and is at the core of the philosophical elements of the liquid ethos. From an ontological perspective, nominalism refers to the doctrine that universals or general ideas are just convenient names — *nomini* — that do not correspond to objective things or concepts (see e.g., Maritain, 1995; Rodriguez-Pereyra, 2016).

Nominalism has two corollaries that are pertinent to this discussion: skepticism and relativism. Skepticism can be broadly understood as the theory that certain knowledge is impossible. Relativism is the theory that knowledge, truth, and morality exist in relation to culture, society, or historical context, and are not absolute (see e.g., Maritain, 1995).

As the most fundamental doctrine of the liquid ethos, nominalism opposes Western rationalism. This opposition can be briefly summarized as the supposition that

there is no world 'out there' existing independently of our representations of it, or, that is of the ways in which we socially construct it through our language; thus, the criterion of the truth of statements cannot be correspondence with such an independent world; truth is not discovered but it is rather made, and is made, moreover, on many different ways, and always with a moral and political intent; thus all truth is 'local' and 'contextual'; there is no knowledge that can claim a privileged, objective, and universal status by virtue of the methods through which it is secured, only 'knowledges' that are specific to particular communities, cultures, and so on, and that serve their purposes (Goldthrope, 2000, p. 67).

In this sense, the main problem with explaining the philosophical underpinning of the liquid ethos is that it is indefinable both in application and according to its own premises.

Furthermore, the philosophical principles of a liquid ethos stand against definitions themselves. Definitions aim at correctness about stating the nature or meaning of things. In turn, correctness implies the existence of objective standards. And the closest thing to the anti-thesis of the liquid ethos *is* objectivity, especially objectivity concerning truth, reason, and knowledge. The liquid ethos avoids any “talk of correspondence” and the idea that “the world or the self has intrinsic nature” (Rorty, 1989, p. 7-8). In short, the philosophical principles of liquid modernity primarily aim toward deconstruction, whereas the business of journalism is to act as society’s primary sense-making practice.

**Summary.** This section addressed the overarching research question: What does news coverage about Crispr reveal about the current journalistic ethos? According to the way journalists implemented the orientations of journalistic change in news coverage about Crispr, it is evident that a high modern ethos still shapes some areas of journalism. That is, both a liquid and a high modern ethos currently shape journalism. These findings suggest that journalism is going through an interregnum — an in-between stage where the old ways of carrying out journalistic practice are known, still used, but found ineffective by some, and new ways of carrying out journalistic practice are being experimented with.

This section also offered one possible explanation concerning journalism’s current interregnum. The distinction was redrawn between the material and philosophical elements of liquid journalism, and nominalism was identified as the underlying philosophy of the liquid ethos. It was suggested that the reason journalism has not fully embraced a liquid ethos is because nominalism is not conducive to allowing journalism to function as society’s primary sense-making practice. Nominalism’s corollaries,

skepticism and relativism especially prevent journalism from functioning as a sense-making institution because these doctrines ultimately deny the existence of objective reality and doubt that it is possible to know objective reality, yet the mere act of engaging in journalism presupposes that there is a reality “out there” and that something meaningful and truthful can be said about it.

## Chapter 6: Conclusion

This qualitative research started out by addressing a common narrative that conceptualizes journalistic change in terms of a shift from a high modern to a liquid ethos (Deuze, 2005; Hallin, 1992). Conceptualizing journalistic change in this manner is an appeal to a sociological framework that also conceptualizes society's broad-scale changes as involving a shift away from high modernity to liquid modernity (Bauman, 2000). Both high modern and liquid modernity manifest materially and philosophically. In short, hardware and objectivity characterized high modernity whereas software and subjectivity characterize liquid modernity.

The impetus for this study were two objections with the prevailing narrative of journalistic change. The first objection was that the narrative does not take into account that journalism is not just one thing; journalism manifests itself in many different ways. To address this objection, this study focused on science journalism. In particular, news coverage about Crispr — a revolutionary development in biology — was homed in on as a case study. The second objection was that the high modern-to-liquid narrative was too simplistic. To address this objection, a multidimensional model of journalistic change was introduced. This model features five journalistic orientations: knowledge, audience, power, time, and ethics (Koljonen, 2013). These orientations are said to make up the journalistic ethos and are also subject to change according to the shift from a high modern to a liquid society. Hence, a qualitative textual analysis of news reports about Crispr from 2014–2017 was carried out. The content was evaluated according to the five journalistic orientations, which served as deductive categories (Kuckartz, 2014).

There were two major findings. The first was that some of the dimensions used to analyze the journalistic orientations can be untenable. For instance, regarding the time orientation, associating the past with high modernism and the future with liquid journalism did not work because journalists tend to invoke the past, present, and future in single sentences. To address this problem, eternalism and presentism were suggested as alternative and opposing dimensions of the time orientation. Regarding the ethical approach, journalists synthesized universal and relativistic ethics. Therefore, rationalistic ethics were introduced as a category between opposing dimensions. Finally, narrative was introduced in the discussion as an additional orientation for understanding journalistic change. It was suggested that narrative can help address whether journalists frame their topics through the lens of high modern or liquid ethos.

The second major finding was that news coverage about science in institutional newspapers is still carried out in the mold of a high modern ethos. The finding that was the most indicative of a liquid ethos was a shift in writing style. News reports about Crispr were not stenographic, rather, they were written in a narrative style. Following the multidimensional model that guided the research, a dimension that directly addresses writing style was suggested: prosaic vs. poetic journalism (Merrill, 1989). Overall, this finding suggests that journalism is yet to undergo a wholesale shift toward a liquid ethos. In the discussion, the concept of interregnum was introduced to interpret the overarching finding. It was suggested that journalism is mirroring society's interregnum, and that journalism's commitment to being society's primary sense-making practice prevents it from fully assuming a liquid ethos. It was also argued that as the underpinning

philosophical principle of the liquid ethos, nominalism is especially unsuitable for allowing journalism to engage in sense-making.

### **Intellectual Patterns and Journalistic Change**

Although the significance of intellectual patterns was not addressed directly throughout this study, certain intellectual patterns were integral. Therefore, the concluding remarks will focus on why understanding intellectual patterns and bringing them to the forefront is important for journalism researchers and practitioners. “Intellectual patterns” refers to the appearance and evolution of ideas and concepts over long periods of time (see e.g., Gordon, 2012). Focus on intellectual patterns in relationship to journalism inevitably requires philosophical knowledge, which is especially appropriate given that both journalism and philosophy are the two humanistic activities that most boldly proclaim devotion to truth (Romano, 2009). In an effort to emphasize the importance of understanding intellectual patterns, the concluding remarks will begin by giving a brief outline of dialectics — arguably the guiding philosophical idea in this research — and their relationship to journalism. Then the focus will turn once more to the doctrines of nominalism and realism to further illustrate why journalism scholarship and practice would benefit from bringing philosophical concepts to the forefront. These concepts will be discussed in relationship to the existing literature and the theoretical framework.

Heraclitus and Hegel are inescapable figures in most discussions about dialectics. Heraclitus himself is commonly regarded as the father of dialectics. His main contributions to the history of ideas were that things are constantly in flux and that oppositions eventually coincide (Graham, 2015). His notion that all is flux is generally

captured in his observation that it is impossible to step into the same river twice. Yet, constant change is necessary for constancy. Without the river's water constantly flowing, there would not be a permanent river. This idea dovetails into his doctrine of the unity of opposites. Given that everything in the world is in flux, there is constant tension and conflict. Something cannot be one hundred percent this or that. A human, for example, is full of oppositions: alive–dead, awake–asleep, young–old (Graham, 2015). Centuries later Hegel elaborated on Heraclitus' ideas and presented an understanding of dialectics that remains popular today. Dialectics is a way of developing opposing ideas or arguments into better versions of themselves through “the immediate vanishing of the one in the other” (Hegel, 1977). This immediate vanishing of the one in the other leads to a synthesis of two previously opposed concepts. Hence, a dialectic approach follows the well-known thesis-antithesis-synthesis pattern that Hegel thought was necessary for understanding reality. In short, according to the dialectic approach, truth and reality emerge from a synthesis of opposing thoughts, ideas, situations, etc.

The Hegelian dialectic forms an integral part of journalistic practice and its concepts; it exerts its “pull on every part of the journalist's work in both very abstract and very concrete areas” (Merrill, 1989, p. 56). For instance, in news coverage about Crispr, when journalists implemented objectivity as balance they were displaying their awareness that opposition was intrinsic to any given viewpoint or related development regarding Crispr. Regarding the prevalence of dialectics in journalistic concepts, the multidimensional model used to carry out the analysis in this study is a case in point: each journalistic orientation featured to opposing dimensions. The presence of the “dualistic entrapment” in journalism can be dangerous because sole dedication to one

extreme can be internalized as journalistic courage or the willingness to stand for something (Merrill, 1989). As a result, this can lead journalists to neglect the possibility of a synthesis. In this study, however, journalists' appeal to rational ethics throughout their coverage of Crispr was indicative that it is possible for journalists to achieve a synthesis that is more in line with reality than dogmatic adherence to either a universalistic or relativistic ethics.

The high modern vs. liquid modern dichotomy was the prevailing dialectal extreme that guided this research. The finding that journalism has not experienced a wholesale shift toward a liquid ethos is indicative that journalism is not persuaded toward one extreme over another, but it also remains unclear whether journalism has managed to achieve a synthesis — a brand of journalism that is not strictly oriented toward a high modern or liquid ethos. Hence the suggestion that journalism is undergoing an interregnum. Given the suggestion that the core philosophical principles of high modernism and liquid modernity are realism and nominalism, should journalism coalesce into something new, it will involve a synthesis of the realism vs. nominalism dichotomy. The potential for such a synthesis highlights the importance of having journalists and researchers be aware of intellectual patterns.

The nominalism vs. realism opposition is commonly regarded as the problem of universals and dates as far back as the pre-Socratics (see e.g. Guthrie, 1962). As alluded to in the discussion, it stems from the following question: Are universal and abstract terms like “good” and “truth” real in the same way that tangible terms like “journalist” are real? Put another way, a journalist is easy to identify in time and place, but where are good and truth found outside of a *good* or *truthful* journalist? Nominalism assumes that

abstractions such as good and true are merely convenient names and labels that are not grounded in reality. Accordingly, the nominalist view assumes that such terms as good and true only say something subjective about reality. According to the nominalist view, using such labels can actually distort reality, especially if political power is at stake. The realist view assumes that good and true are as real as a good and truthful journalist. Hence, according to the realist view, to describe something as good and truthful is to say something objective about reality.

Thus far, this brief discussion may seem overscrupulous, but these philosophical struggles are beneath the surface of existing literature on journalistic change, which tends to focus on shifting conceptions of objectivity (Christians, 2004; Elliot, 2008; Hallin, 1992; Karlsson, 2010). The adage that “facts don’t speak for themselves” is perhaps the clearest way that the push and pull between realism and nominalism manifests itself in journalism. The liquid modern tendency toward subjective/analytic reporting takes as its guiding principle that it is impossible to separate facts from values. For instance, a journalist writing in the mode of a liquid ethos would call into question that the statement “Crispr is good for society” is a fact, not just because Crispr may lead to undesired consequences in the future, but also because there would be skepticism toward the existence of *goodness*. Hence, through the lens of a liquid modern ethos, a statement such as “Crispr is good for society” is merely a value judgment, even if there would be mounting evidence showing that Crispr has had a net benefit on society. As mentioned in the discussion, journalistic practice depends on the ability to make objective statements to engage in sense-making.

In summary, at first it may seem that bringing intellectual patterns to the forefront of journalistic research and practice has very little practicality. But in the context of this research, familiarity with intellectual patterns would help researchers understand the journalistic ethos in light of broader-scale intellectual developments. One of the benefits of understanding the journalistic ethos in the context of broad-scale intellectual developments is that it can facilitate the identification of the seemingly permanent orientations of the journalistic ethos and their dimensions. For practitioners, being aware of intellectual patterns can prevent them from falling into ideological traps that can interfere with their work.

### **Limitations and future research**

The overarching limitation of text-based analyses is that they do not lend themselves to replication and generalizability (Fairclough, 2003; Fursich, 2009; Philo, 2007). Two of the main reasons text-based analyses are not replicable and generalizable are that a text can be interpreted in an infinite number of ways and text-based research tends to be merely descriptive — research that is solely descriptive can be problematic because it fails to consider the production process of news making, audience analysis, the use of sources, market pressures, and the logic of newsgathering (Philo, 2007). But these concerns were addressed in the methods section, which suggested that using the key orientations of journalistic change as deductive categories work as interpretive boundaries, thus leading to practical interpretations. In addition, the suggestion that textual analysis must be accompanied by investigations into news making processes and audience reception fails to view textual analysis beyond its descriptive possibilities. In the context of this research, text was analyzed as an ongoing negotiation over the five

orientations of journalistic change (see e.g. Hall, 1975). As such, textual analysis led to insights into the prevailing journalistic ethos.

Another limitation in this research was its use of purposeful sampling — science journalism is not limited to print news articles in institutional newspapers. As part of the broader science communication, science journalism spans offline and online platforms. Although institutional newspapers have long been the main employers of science journalists, increasing commercialization and a competitive environment of print and online science journalism have increasingly led science journalists to take their work to a variety of online platforms (Dunwoody, 2014; McManus, 1994). Furthermore, it is increasingly the case that people who want information about science rely on searching the Internet rather than legacy media platforms such as institutional newspapers and magazines (Dunwoody, 2014). But purposeful sampling is characteristic of a lot of qualitative research, whose principle aim is usually to discover, understand, and interpret findings according to the concept, model, and theoretical framework that structures the study (Merriam, 2009).

Future research should further investigate journalistic change by incorporating the high modern to liquid theoretical framework and Koljonen's (2013) model of journalistic change. Although the common way of crafting normative discourses in journalism research has been to construct a narrative of change (Deuze, 2006; Elliot, 2008; Hallin, 1992; McChesney & Nichols, 2010; McChesney & Pickard, 2011), this study suggests that change may not be swift and comprehensive as some journalism scholars suggest. Future research could especially focus on science journalism found in online platforms and investigate if there is a correlation between a liquid ethos and online platforms.

Furthermore, future research devoted to change in science journalism could incorporate the theoretical framework and model used in this study to elaborate on the deficit and dialogue models that prevail in science communication (see e.g.: Buchhi & Trench, 2014; Einseidel, 2014; Fahy & Nisbet, 2011). Alternatively, future research could apply this study's framework and model to other areas of journalism altogether because the five orientations of journalistic change are likely to manifest differently in other areas. For instance, investigating how the knowledge orientation manifests in religion journalism would be interesting given that religion, like science, engages in making truth claims about reality. Ultimately, such research would help map a clearer picture of change in the entire journalistic field.

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## APPENDIX

\*Below is a table with a list of the newspapers that were used for this research.

Arizona Republic	1
Austin American Statesman	1
Boston Globe (Online)	3
Boston Globe	33
Charleston Gazette - Mail	6
Concord Monitor	1
Contra Costa Times	3
Daily Herald	1
Daily Press	1
Dayton Daily News	2
Des Moines Register	3
East Bay Times	1
Florida Today	1
Gainesville Sun	1
Honolulu Star - Advertiser	1
Los Angeles Times	11
Morning Call	2
New York Post	1
New York Times	9
News Journal	1
Newsday	1
Oakland Tribune	3
Orlando Sentinel	1
Pantagraph	2
Philadelphia Inquirer	2
San Jose Mercury News	3
Savannah Morning News	1
South Florida Sun - Sentinel	2
Spokesman Review	4
St. Louis Post - Dispatch	4
Sunday Gazette - Mail	2
Telegraph - Herald	5
The Baltimore Sun	1
The Christian Science Monitor	2
The Daily Beast	2
The Examiner	3

The Greenville News	1
The Ledger	2
The Mercury News	2
The News Journal	1
The Record	1
The Times - Tribune	1
The Union Leader	1
The Washington Post	14
USA Today	1
Valley News	3
Wall Street Journal	24
Wisconsin State Journal	4
<b>Total</b>	<b>186</b>

## VITA

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