

Narratives of Mastery and Resistance: Lay Ethics of Nanotechnology

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Abstract This paper contributes towards a lay ethics of nanotechnology through an analysis of talk from focus groups designed to examine how laypeople grapple with the meaning of a technology ‘in-the-making’. We describe the content of lay ethical concerns before suggesting that this content can be understood as being structured by five archetypal narratives which underpin talk. These we term: ‘the rich get richer and the poor get poorer’; ‘kept in the dark’; ‘opening Pandora’s box’; ‘messing with nature’; and ‘be careful what you wish for’. We further suggest that these narratives can be understood as sharing an emphasis on the ‘giftedness’ of life, and that together they are used to resist dominant technoscientific and Enlightenment narratives of control and mastery which are encapsulated by nanotechnology.

Keywords Control · Lay ethics · Narrative · Nanotechnology · Public perceptions

While the quest to understand public perceptions of nanotechnology has become a crucial part of research into the technology’s ethical, legal and societal aspects, little of this work has examined the ethical content of these perceptions. Similarly, ‘official’, or institutionalised, ethics [41] has rarely considered lay perspectives [12, 22]. In this paper we begin to close this gap by presenting an analysis of lay ethics of nanotechnology. In doing this we draw on a small but significant literature which has started to distinguish such lay ethics from that of professional ethics and to use lay perspectives to enhance ethical understanding and its public policy import. So far such analysis has focused largely on the life sciences and the new genetics [3, 38, 39, 41].¹ By contrast we examine lay talk about nanotechnology, analysing key themes and concerns within this talk and identifying five narratives which structure and underpin it: ‘the rich get richer and the poor get poorer’; ‘kept in the dark’; ‘opening Pandora’s box’; ‘messing with nature’; and ‘be careful what you wish for’. Significantly, then, we suggest that lay ethics can be understood as taking a narrative form.

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¹ Banks et al. [3], for example, examine the ways in which laypeople make ethical judgements around prenatal sex selection, identifying expressions of instinct, rational argument, reference to principles, use of personal experience, analogies and examples and slippery slope arguments within discussions.

Understanding Nanotechnology: Master Narratives of (Nano)Technoscience

Lay narratives of nanotechnology cannot, however, be considered in isolation: they are produced in response to contact with the ways in which nanotechnology is currently being envisaged by different actors and in different domains. These in turn are connected to larger social imaginaries of science and technology in contemporary society. Felt and Wynne [11] stress the importance of these, noting that within “modern technoscientific societies, narratives that blame ignorance and privilege scientific knowledge have become sufficiently entrenched to be regarded as master narratives” (p.77). It has become a commonly held assumption, in other words, that scientific narratives automatically trump those emanating from lay communities. They are ‘master’ narratives both in terms of their sweep [25] and the power which they are able to exercise. Felt and Wynne suggest four key elements of such technoscientific master narratives. First, there is a link between science, technology, and progress, so that technoscience is framed:

unambiguously as the solution to a range of social ills ... Innovation in this imaginary, and the master-narratives that sustain it, is always conceived as unconditional good. (p. 80 of [11])

Thus in this narrative the increase of scientific knowledge and the development of new technologies is seen as inevitable and is viewed as fundamentally positive. As Sandler [36] says in his discussion of nanoethics, innovation and its accompanying social benefits are seen as “inexorable”. Second, there are narratives about the *quality* of good or rigorous science—specifically, that for science to be good it must be ‘objective’ and ‘rational’. Felt and Wynne note that such notions “presuppose that there is indeed a fully objective, independent and impartial domain of technoscience that experts can tap into” (p. 81 of [11]). (We might also compare this to previous discussions of the importance of ‘sound science’ [18]; here, again, the relative value of knowledge is judged in relation to a set of narrow—and multiply problematic—standards.) Third, Felt and Wynne suggest that there are interconnected narratives about the relationship of ‘the public’ to science. These include those that see publics straightforwardly as a problem with which science needs to deal (as in the deficit model; [19]), but also

those that conceptualise the public as a resource for the coproduction of ‘successful’ science—hence, for example, an emphasis on public engagement and participation as a means to gaining public trust or acceptance [43]. Finally, there is a narrative of ‘unintended consequences’. This, according to Wynne and Felt, is a catch-all explanation of all technological failure which sets it down to uncontrollable and unknowable accidents and which therefore exonerates those involved from any blame.

These master-narratives are apparent in discourses around nanotechnology. We need only refer to documents from, for example, the European Commission, or various ‘soft law’ initiatives [10, 33], to find the narratives that Felt and Wynne describe being drawn upon: inevitable development twinned with new social benefits; the public as a potential problem holding the technology back, needing to be enrolled through processes of engagement and communication; an innocent science that takes all possible precautions.² More specifically, a number of authors have argued that nanotechnology can be understood as driven by visions of mastery and control over matter—visions which have their root in the Enlightenment, have marked the scientific project throughout history, and which reach their epitome in the promises surrounding nanotechnology. Take, for example, Richard Feynman’s words in a lecture claimed by nanoscientists as discipline-defining: “I am not afraid to consider the final question as to whether, ultimately—in the great future—we can arrange the atoms the way we want; the very *atoms*, all the way down!” [13, 42]. Bensaude-Vincent [4] suggests that the metaphysical backdrop to nanotechnological research programmes contains an all-pervasive metaphor of both nature and technology as machine-like—although the characteristics of these machines may vary, being shaped in part by the ‘parent

² Several of these feature in the extract below, taken from a European Commission strategy document:

Without a serious communication effort, nanotechnology innovations could face an unjust negative public reception. An effective two-way dialogue is indispensable, whereby the general public’s views are taken into account and may be seen to influence decisions concerning R&D policy. The public trust and acceptance of nanotechnology will be crucial for its long-term development and allow us to profit from its potential benefits. It is evident that the scientific community will have to improve its communication skills. (European Commission 2004: 19)

discipline’ from which nanoscientists have emerged. Kearnes similarly traces the notion of mastery (‘power over’) from its roots in Baconian thinking and suggests that contemporary research programmes—including nanotechnology—are in fact shot through with multiple notions of control (as ‘power to’) alongside traditions of more direct manipulation. He suggests that:

in systems conceptions of chemical and biological processes—and in particular the nanoscale—control [emerges] as a dominant trope for orienting technoscientific practice. Systems understandings require a new conception of power or physical capacity. Rather than directly manipulating matter, power ‘works with’ or seeks to control the operation and parameters of the system ... ‘Power over’ (*potestās*) is replaced by more contingent notions of control as ‘power to’ (*potentia*). (p. 106 of [20])

Nanotechnology, then, is a technoscience *par excellence*, a true inheritor of the rhetoric of modernity. It combines narratives of the inevitability and unambiguous goodness of progress with tropes of a control that is absolute and which operates in multiple ways. In this way it can be understood as an exemplar of a particular way of thinking about the world—and it is this way of thinking, it seems, which is being resisted through the use of a very different set of narratives in lay talk.

Understanding Public Responses: As Content

This contrast—between dominant technoscientific narratives of absolute control and resistant lay narratives—has not, however, been examined in any detail within the literature. The ethical content of lay perspectives on nanotechnology has received little attention, although in recent years a body of work has emerged which has attempted to map the understandings, enthusiasms and concerns of lay publics about nanotechnology—a body which can be represented as, in brief, showing that publics are cautiously enthusiastic about nanotechnology’s potential, though concerned about its regulation and oversight. While a number of surveys have given a sense of public awareness and opinion of the technology and some of the factors that dictate this [2, 6–8, 14, 15, 24, 27–29,

31, 32, 37], qualitative studies have shown in more detail the texture of public concern and the directions laypeople are keen for nanotechnology to take.

Such qualitative studies have found considerable ambivalence towards the technology: while there is enthusiasm and excitement about prospective applications, notably in the medical domain and with regard to nanotechnology’s potential to improve quality of life, concerns are also expressed about transformative impacts which could restructure social and economic life and possible long-term and unforeseen effects [5, 21, 26]. A report by the Nanotechnology Engagement Group (NEG, see [16]) summarised the findings of UK public engagement on nanotechnology³ as relating to three key areas consistently raised by lay publics: deliberating nanotechnology: the need for research to focus on nanotechnology with clear social benefits, such as medical or energy technologies; concerns about uncertainty and regulation; and the need for openness, transparency, and public engagement. Laypeople, then, while enthusiastic about some applications, tend to view technological innovation as a double-edged sword. They are concerned about the social context that technologies develop in, and keen to see processes of technological governance opened up.

The research on which this paper draws sought to build on this small body of work, using extensive empirical interventions to try and uncover in more detail the ways in which public responses to nanotechnology develop and are resourced. In responding to the challenges of public engagement on emerging technologies—lack of public awareness, the ‘incredible tininess’ of nanotechnology, the complexities of devel-

³ These included the 2005 NanoJury UK, a citizen’s jury; the 2004–06 Small Talk programme, which sought to coordinate science communication-based dialogue activities; Democs, a conversation game designed to enable small groups of people to engage with complex public policy issues; the Nanodialogues project (2005–6), a series of practical experiments to explore whether the public can meaningfully inform decision-making processes related to emerging technologies in four different institutional contexts; and the ESRC funded ‘Moving Public Engagement Upstream’ project (2004–06), set up to examine the contribution of nanotechnology to sustainable development by developing socially and environmentally-sensitive governance processes which move the site of public engagement upstream.

oping a ‘nano-imagination’ (see [26, 30])—we drew upon group performance and theatrical techniques based on the work of the Brazilian dramatist Augusto Boal on the ‘Theatre of the Oppressed’ (see [1]). Theatrical techniques are able to harness unexamined, affective and intuitive ethical responses, and thus provide insight into the social dynamics and the perceived moral orders driving those responses. Through them it is possible to examine the shaping of ethical narratives and the resources that people bring to bear on this process. The research, carried out in the UK, involved six groups (of six to eight individuals), covering standard demographic criteria, and selected around commonalities likely to have relevance to negotiations of the ethical issues nanotechnology presents.⁴ Each group met twice, for an evening focus group, and then, in conjunction with another group, for a Saturday workshop. Focus groups lasted approximately three hours and involved an initial discussion of the role technologies played in participants’ lives before a fuller discussion around stimulus material introducing nanotechnology and the visions around it. The workshop gave participants the opportunity to further reflect on and act out futures in which aspects of nanotechnology had become reality.

This series of engagements therefore provides a large tranche of data which can be used to examine the ways in which laypeople grapple with the meaning of a technology that remains ‘in-the-making’. While each group discussion had its own character and emphasised certain issues—one group, for example, focused on questions with a global scope, while the discussions of another were particularly tinged with a sense of inevitability and personal powerlessness—key themes were also repeated across all groups. The data can be read as providing an account of the ethical content and context of lay hopes and concerns around nanotechnology.

A significant part of the discussions were concerned with far-reaching questions surrounding what it means to be ‘human’, and the ways in which nanotechnology threatens this. Being human was seen as having something of a sacred quality, or as something that

should not be tampered with unless for good and well considered reasons. Key threats to this notion of the human posed by nanotechnology included the potential for loss of individuality, for the disruption of a natural life course (in terms of conventional understandings of birth and death), and for the blurring of human life with machines. For example, the concept of a particular and settled life course was frequently drawn upon. While people agreed that conventional understandings of the life span were changing, not least due to technological advances, the core concepts of life and death were nevertheless seen as constants. As this extract from one group’s discussion indicates, “we’re born; we die” was seen as fundamental to being human:

Sam: The one issue I have is this issue about death. Which is a obviously a um goes against the grain of the human race. We’re born, we die. Without the two end products the human race will not exist.⁵

This thematic position converged with discourses of the ‘natural’ and of the dangers of messing with natural orders. These categories were at times self-consciously reflected upon and critiqued, but remained key in many people’s arguments. The extract below shows a participant summing up his views at the end of a set of exchanges about human/machine differences and parallels, following a more specific discussion as to whether the ‘unnatural’ is necessarily bad:

Liam: My thing was the sort of the—a lot of the things that were said seem wonderful and we should be working on them as fast as possible, but a few of the things were a bit—messing with natural things, pushing—too much human interference in natural things is a very scary prospect, and you need to be very careful whenever you do anything like that, like designing babies or putting stuff in ecosystems or anything like that. So, messing with the natural order of things, I guess.

Individual choice and autonomy were also seen as key categories in negotiating the rights and wrongs of using nanotechnology. Sometimes this was framed as being an issue of consumer choice; most often,

⁴ The groups were: a church group; a student environmental and social justice group; a group of (female) users of organic products and alternative therapies; a group of (male) ‘confident supporters’ of technology; a group with interests in local community involvement; and a group who saw themselves as having management responsibilities in their workplaces.

⁵ All names have been changed to ensure anonymity, although the gender of the speaker is indicated by the name given; in this case, ‘Sam’ is male. ‘Mod’ represents the researcher charged with moderating the discussion.

however, it was expressed in the view that it would be wrong to dictate particular ways of behaving to others, as in the comment below:

Mod: Are these like things that we all should abide by? Or does it depend on some person or company?

Pat: On the person. I would not let you decide something I wanted to do. It would be up to me. I would not decide something you wanted to do. It's up to the individual.

The power of commerce was frequently mentioned in the discussions. This was expressed in several ways: consumption practices were seen as important drivers of the technology and as generating potentially unsustainable and socially disruptive pathways. The groups were frequently critical of this, but at the same time acknowledged its power and its allure (leading to the sense that they, as consumers, were at least partly responsible for the way in which the technology was driving forward through their purchase of new products and services). But financial drivers were also referred to more generally. Money—from big business or government—was seen as *the* key force shaping new technologies. Such technologies, then, were ultimately viewed as driven by self-interest and as likely to develop in ways divorced from a wider sense of the public good.

Discussions of financial drivers often linked to broader questions about control, distrust of those seen as being behind nanotechnology, and feelings of powerlessness. The exchange shown below is typical, indicating a shared sense of lack of choice, lack of knowledge, and lack of control:

Mod: That's interesting. Is there a sense of inevitability by the way?

Tess: Yes.

Mary: Frighteningly so.

Evan: I think so.

Della: Yes.

Cath: Yes, terrifyingly so.

Evan: You're getting it whether you want it or not.

Mary: Well we are in those products there that are presumably all available in [town name]. We didn't know even.

Tess: Exactly.

Mary: It's happening. It's coming to us.

Evan: Too much is like a massive financial railroad that's behind it that's just driving it on.

These themes overlap and interconnect: the seductiveness of nanotechnology's promises co-existed with participants' expressions of ambivalence towards the technology, while the way in which nanotechnology intensified existing anxieties was linked to concerns about a consumption-driven society. In addition, as previous research has suggested [21], many of these concerns were connected to participants' experience of those driving and funding the technology, such as national governments, big business and the military. What are their motivations? How will they affect how the technology will be used? And can they be trusted? Ultimately, many people thought that the accumulation of these factors would inevitably generate a disaster of some kind, whether environmental, social, or moral.

Understanding Public Responses: As Narrative

Data from qualitative interventions can, then, be understood as providing a sense of how public groups are likely to respond to nanotechnology as it develops and impinges more and more on everyday life. But it can also be analysed to explore in more detail how such concerns are created and structured within talk. What underpinning dynamics drive anxiety about, say, the big business drivers of technology? How do such concerns fit into broader society?

Our analysis suggests that the concerns and excitements that appear within focus group talk can be understood as being structured by a number of archetypal and deep-rooted cultural narratives—familiar and enduring stories which act as a resource for responding to new developments. These are 'master-narratives' in Agnes Heller's sense: "guides of imagination" and "references to a shared tradition" which are "not just cognitively understood but also emotionally felt, without footnotes, without explanation or interpretation" (p. 257 of [17]). The narratives we identify as important in the focus group context are familiar stories that are deeply embedded in European culture, and which provide foundation and strength to a more broadly applicable type of imagination. Concerns about nanotechnology, in other words, form part of a larger context of concerns about technological society in general, and general cultural storylines can be applied to them. We have identified five such narratives underpinning responses to the issues posed by nanotechnology: 'be careful what you

wish for'; 'opening Pandora's box'; 'messing with nature'; 'kept in the dark'; and 'the rich get richer and the poor get poorer'.

The names of the five narratives indicate, in shorthand, their storylines. Indeed, their very familiarity is a sign that they are deeply rooted within contemporary culture, and can be understood as mythic cultural tropes. We briefly characterise each of these narratives below, adding some illustrative quotes to give a sense of the ways in which aspects of each narrative shapes the talk of public response to nanotechnology.

'The rich get richer and the poor get poorer' This narrative derives from considerations of political economy and the way in which commercial and consumption-oriented drivers are likely to engender further injustice and inequality, both globally and locally. Ultimately, the story goes, promises of green or socially relevant technology will prove illusory in the face of commercial drivers that will result only in the rich—big business and the already-powerful—benefiting, while the poor or excluded will remain so. At a global level, this draws together concerns about a wealthy, consumer product-focused West enjoying both the technologies and their profits, while the global South is left behind; on a more local level, it is linked to concerns about the practicalities of ordinary people securing access to medical advances or consumer goods enabled by nanotechnology—as in the extract below, in which the question of cost to the individual is addressed:

Oscar: I would like to hear—to reflect if there are any negatives certainly about how—we've already mentioned the question of cost. Who can afford it?

(Group 6—Authority Group)

This narrative, with its normative emphasis on equal access to the benefits of nanotechnology, encodes powerful notions of morality. Ideals of justice, fairness, and equality are thus used to critique nanotechnology's potential development.

'Kept in the dark' The 'kept in the dark' story expresses a deep-seated sense of powerlessness shared by participants in the face of nanotechnology's

troubling but inevitable development. Not only were participants generally unaware of the technology's existence and potential, but they had—they argue—little way of having any meaningful impact on it. Thus, as Tess says:

Tess: I think, for me, it's that powerlessness really. People, me, we, probably feel quite powerless to actually make any difference to what's going to happen. Because a lot of it has already been happening...

(Group 1—Church Group)

The narrative thus weaves together a range of ideas around control and power as well as the sense of modern alienation in the face of secret and unreachable institutions. Such institutions included government, corporations and the military, all of which were viewed as driven by dubious motivations (power, self-interest, money) and as likely to drive the technology in problematic directions.

'Opening Pandora's box' The story of Pandora's box is a familiar one: a temptingly closed box, when opened, releases the gamut of human evils. It incorporates ideas of potentiality and uncertainty, of hubris and meddling with things that should be left alone, and of danger and, ultimately, disaster. Such notions are important in structuring lay responses and negotiations of nanotechnology. Indeed, the Pandora's box story is at times explicitly mentioned as symbolising participants' concerns:

Mary: This is all then the equivalent of opening Pandora's Box isn't it? It looks great but you take the lid off and then out it comes, there's no getting it back in again.

(Group 1—Church Group)

Such a narrative brings together concerns about the technology's unforeseen risks, uncertainty, and danger—all of which are viewed as key realities arising from a science that is hubristic and arrogant in meddling with what it doesn't fully understand. Linking in to the 'kept in the dark' narrative, misuse and disaster are seen as almost inevitable: those driving the technology, its effects once 'out of the box', and the inevitability of it 'falling into the wrong hands' make this a near certainty.

'Messing with nature' This narrative summarises concerns around the disruption of nature, the natural, and the human. It implies that orders and boundaries which should—generally—be left alone are being dangerously messed with, blurred and transformed, and it therefore encodes an ethical judgement: nature should not be 'messed' with. (Note that this leaves open the possibility of other, permissible ways of interacting with and transforming nature. It is the notion of 'messaging'—or tampering, or fiddling, or tinkering—that is morally dubious.) Boundaries around the human are not the only ones seen as being potentially transgressed. Natural orders more generally were viewed as threatened by nanotechnology in narratives around the destruction of (right) limits and boundaries. For Deb, for example, disruption of the human life course links in to a broader re-negotiation of evolution as a general principle:

Deb: It's kind of the fact like there's no reason to die at all, it kind of makes you think where's the world going to, it's kind of going against the whole evolution survival of the fittest if you start eradicating all the diseases, and helping people live forever. You have to re-question what life is.

(Group 2—Student Green Group)

Particular flashpoints for these concerns were troubling notions of nanotechnology as enabling actors to 'be God' or to 'create', 'make', 'fabricate', or 'engineer' life and the future (see [40]): this talk seemed to summarise many of the threats the technology presented.

'Be careful what you wish for' This final narrative draws together ideas about perfectibility, desirability and the ethically troubling character of nanotechnology's seductive promises, as expressed in the ancient notion that getting exactly what you want may not ultimately be good for you. Given that nanotechnology is seen as fundamentally driven by commercial considerations, it is inextricably linked to a framework of consumption and consumer products, often seen as at least superficially desirable. These desires are, however, interwoven with moral stories about whether it is right to indulge them. Nanotechnologies are presented as temptations into which people are seduced but which may have harmful consequences—

such as social inequality and breakdown, as in the extract below:

Theresa: Um, and I just think we, if we all... if the way life is now, it's all materialistic, it's all shallow and we think everybody should look perfect and that's the priority in life, if this heads the way it looks like it could possibly be heading, what about these poor people who are going to be caught right in the middle of it where some people are going to look perfect and some people aren't going to have the money or the ability to access whatever is going to matter. So we may be perfect, but what about these other people who can't look perfect and the emotional, the breakdown that's going to happen is going to be so unnatural.

(Group 3—Female Natural Health Group)

In particular, nanotechnology's promise of perfectibility is seen as double-edged: participants are 'careful of what they wish for' in that perfection is itself seen as a dangerous path. This narrative is perhaps the most clearly moral of all that we have identified. It encodes the ethically loaded concepts of seduction and temptation, and also links to stories about 'being human' through celebrating the fragility and imperfection of human life.

Understanding the Nature of Narrative in Talk

Lay talk about nanotechnology can, then, be understood as structured by five underpinning narratives. However, it will be clear that although we have presented these as five separate storylines, they interconnect in numerous ways: thus anxiety about inequalities of consumption is developed into concern about the business drivers of technology, which points to inevitable development and disaster, which is read as a profane hubris when applied to the manipulation of natural orders, which leads on to an emphasis on the value of fragile human experience and the danger of 'perfection'. The narratives can, then, be read as part of a single narrative arc—albeit a complex and branching one. Similarly, we can readily pick out a number of common threads which run through several of the narratives: the constitution of (nano)technology as fundamentally commerce-oriented, inevitable

development and disaster, threats to what is held to be valuable, the multi-faceted nature of control. The narratives as we have described them, then, are at the very least inherently intertextual. This ‘messiness’ points to the fact that we have, in our description and analysis of focus group data, ordered and smoothed out complex and frequently chaotic talk [23]. Our analysis, as with any, has been performative, working to create what it purports to describe.

This process of the imposition of order onto messy data has also meant that that we have paid relatively little attention so far to the diversity that occurs within particular narratives and to the presence of counter-stories to them. It is important to note, however, that these are present. Thus the narratives that we have identified may appear in different forms and be used in different ways, and, as the extracts we have given have demonstrated, leave their traces upon talk with varying degrees of completeness. It is also important that these narratives, though the dominant way through which focus group talk is organised, are not comprehensive in the sense of perfectly encapsulating *all* talk that is present. Counter-narratives are at times drawn upon—indeed, are one way of identifying the narratives through what is being resisted and rejected. Thus, for example, while the ‘messing with nature’ narrative is a key one for dealing with the blurring of life and non-life boundaries, suggesting that this boundary is indeed a significant one for laypeople, at a few points participants chose to argue the opposite perspective to this: that there is no danger in thinking of life as a machine:

Ben: How do we know—Again this is silly, but how do we know that we're not machines? We have no idea about our origins at all really. Apart from that, we've developed over a long period of time but how do any of us know that we are not ... How do we know that there's no fundamental difference?

(Group 2, Student Green Group)

Here Ben tentatively tests out an argument that responds directly to the discomfort often expressed at the understanding of humans as machines. If “there's no fundamental difference”, then there are no boundaries to blur. His suggestion thus radically intervenes in the ‘messing with nature’ narrative, disrupting its storyline and instead drawing on cultural trends—including dominant technoscientific narratives

[9]—which are happy to understand the human as an essentially machine-like system. Similarly, at times participants may portray themselves as empowered and able to act in regard to nanotechnology (rejecting the ‘kept in the dark’ narrative), or describe the risks involved in nanotechnology as inevitable, normal and manageable (subverting the themes of ‘opening Pandora’s box’). While the narratives we have identified and described dominate the data, then, we also catch glimpses of other kinds of stories emerging from within the talk of our participants.

We can, in fact, understand the narratives themselves as multiple and dilemmatic. They tell particular stories, certainly, but these stories are inherently reflexive, open to the position and purposes of the speaker drawing on them, contingent on circumstance, and enabling reflection on the perspective of others. Counter-narratives are present within talk, but, in addition, many of the narratives have built into them an awareness of these counters. Another way of saying this is perhaps simply to note that these are complex and contested narratives. Although they can be summed up in a single phrase, they are not straightforward in the way that, say, the phrase ‘nanotechnology’s risks outweigh its benefits’ and its associated discourse would be. Although they may suggest normativities they are not simplistically ‘pro’ or ‘anti’ technology, but instead encapsulate dilemmas and ask questions—giving scope for participants to take a number of different positions.

Such narratives, then, take seriously the complexity of lived experience. They offer a view of the world which attempts to capture the dilemmas and difficulties we all face in deciding how to live, and represent a persistent sense that other views—within ourselves and in others—are possible and permissible. They are thus sociologically sophisticated and present themselves in our data in complex and messy ways.

These commonalities, however, while analytically important, explain only to a limited extent why these particular narratives are drawn upon in responding to nanotechnology. Certainly, stories which represent more readily the complex and multiple experience of everyday life are useful, but these narratives are doubtless not unique in doing this in a sophisticated manner. Why these narratives, in this context? We suggest that the narratives we have identified have a number of common features in their content and, in particular, that they can be understood as working to

reject the master-narratives of science, progress, and mastery described earlier. They share a disconnect to the visions of the Enlightenment, and instead can be seen as pre- or a-modern in the values they convey. It is this that binds them together, and which makes them so peculiarly relevant in responding to a technology that can, as we described above, be understood as a pinnacle of the trend towards idealised and total control.

This contrast can be explored in more detail using the writing of Michael Sandel. In recent work [34, 35] he analyses the ethics of genetic engineering, concluding that current approaches are both limited and limiting in terms of their attempts to disaggregate the rights or wrongs of particular interventions. He remains, however, deeply ambivalent about practices of “enhancement” (both those which are clearly, and not so clearly, technological in nature), suggesting that “the deepest moral objection to enhancement lies less in the perfection it seeks than in the *human disposition* it expresses and promotes” ([34], emphasis ours). Thus his unease stems not from the actual outcomes of technological intervention—his case is not against perfection *per se*—but from the effect that striving for it has upon us. His concern is with what kind of humans we become—what ways of being are promoted—when we seek to design (or control) ourselves and others.

He illustrates this by setting up a contrast between the two different “habit[s] of mind and way[s] of being” (p. 96 of [35]) that he sees as being at stake: the drive towards mastery expressed in the desire for enhancement and perfection, and what he understands as an “ethic of giftedness” [34]. Mastery, he argues, takes us towards a wilful way of being which emphasises personal responsibility in a process of becoming entirely ‘self-made’. It tilts us towards hubris and leads to an inadvertent—and potentially insurmountable—‘explosion of responsibility’ because the more we control our own natures “the greater the burden we bear for the talents we have and the way we perform” [34]. Sandel acknowledges that this drive towards total control is ‘appealing’ and ‘intoxicating’, suggesting that it is:

possible to view genetic engineering as the ultimate expression of our resolve to see ourselves astride the world, the masters of our nature. But that vision of freedom is flawed. It threatens to

banish our appreciation of life as a gift, and leave us with nothing to affirm or behold outside our own will. (pp. 99–100 of [35])

A disposition oriented towards ‘giftedness’, then, rejects total control in order to take pleasure in the unexpected. It breeds humility—the “awareness that our talents and abilities are not wholly our own doing” [34]—and solidarity, resulting in ways of being that are marked by grace and generosity. As Sandel says, “[t]he more alive we are to the chanced nature of our lot, the more reason we have to share our fate with others” [34].

Sandel sets up the comparison between ways of living that focus on ‘mastery’ or ‘giftedness’ in order to argue an ethical point, and it is clear which disposition he finds more attractive. But we do not have to use the dichotomy normatively in order to find the contrast useful. For our purposes, it is enough that it is possible to map these two ways of being onto the narratives driving nanotechnology and those used in response to it. Sandel’s notion of ‘mastery’ can be linked to the narratives of nanotechnology that we have described above: both emphasise control and convey a sense of inexorable progress towards a particular notion of human development (encapsulated by Sandel’s description of “human freedom unfettered by the given”; p. 99 of [35]). The lay narratives we have identified, then, can be read as resisting this drive to mastery, and as being marked by qualities of ‘giftedness’ which point to a fundamentally different conception of the values and virtues of being human.

We would suggest that these ideas—of mastery opposed and giftedness affirmed—can be traced through all of the narratives, either as dangerous control to be rejected or as a more generous way of living to be sought after. Thus two of the narratives—‘messing with nature’ and ‘be careful what you wish for’—expressly emphasise the value of fragile human life, as it given and not as it is made. ‘Messing with nature’ highlights anxiety about seeking to control life, when it should instead be valued for what it is, while ‘be careful what you wish for’ tells of the destructive effects of ‘perfection’ once it is obtained. ‘Opening Pandora’s box’ refers to technological hubris that will almost certainly lead to disaster. ‘Kept in the dark’ similarly expresses the doubt that those technologies that seek to control matter can ever be adequately controlled by those driving them, and suggests that their very

existence makes us less human by the autonomy they remove from the great majority of laypeople. Finally, ‘the rich get richer...’ narrative affirms, through the ethical stance it takes up, an ethos of generosity, equality, fairness. It speaks of a society that shows solidarity rather than greed and which is interested in more equal communities rather than individual gain. We might also note, in addition, that all of the narratives express a fundamental distrust of the notion that technological progress is unambiguously useful and good. While they do not portray clear cut stances, they tend towards the dystopic and at times expressly affirm the sense that the onward march of nanotechnology is neither necessary nor beneficial.

Sandel’s notion of giftedness—in the shape of humility, generosity, and the valuing of what is given—can, then, be traced through the five lay narratives we have discussed. More broadly we can characterise these as being essentially amodern, rejecting the visions of progress, rational knowledge, and control that the Enlightenment project entails. They affirm, as we have said, an entirely different ‘human disposition’: their metaphysics is premised on different grounds and they carry very different assumptions. It is for this reason, we would suggest, that these narratives become important in the context of lay discussions of nanotechnology. Focus groups on nanotechnology reveal, in lay talk, a battleground of narrative meaning: a dichotomy between nanotechnology, identified as the pinnacle of modern thinking and the carrier of all the stories that entails, and the amodern narratives which are used to resist this story of modernity. Lay ethical narratives then, cannot be understood in isolation. While we can identify their content—the moral concerns which they focus on—their meaning only becomes clear when they are understood as narratives of resistance, standing out in relief from the dominant stories of our technoscientific culture.

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