The Technological Future of Love

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Abstract

How might emerging and future technologies—sex robots, love drugs, anti-love drugs, or algorithms to track, quantify, and 'gamify' romantic relationships—change how we understand and value love? We canvass some of the main ethical worries posed by such technologies, while also considering whether there are reasons for "cautious optimism" about their implications for our lives. Along the way, we touch on some key ideas from the philosophies of love and technology.

Introduction

In the 2014 film *Ex Machina*, an eccentric rich inventor is developing humanoid robots at a remote research facility. A talented computer programmer, Caleb, is brought to the facility for an updated version of the so-called Turing Test between himself and a robot named Ava. In the original Turing Test, named after the mathematician and pioneering computer scientist Alan Turing, a machine is supposed to imitate a human interlocutor: if an observer can't tell the difference between the machine and a human conversation partner, the machine is deemed to have human-level intelligence. In the film version of this test, the aim is to convince the human, Caleb, of something more: that the machine has subjective consciousness. In fact, Ava not only succeeds in convincing Caleb that she is conscious. She also convinces him that she has romantic feelings for him, which Caleb reciprocates. But it all turns out to be a scheme on the part of the robot; she was manipulating Caleb in order to escape from the research facility.

In another film – *Her* from 2013 – the main human character, Theodore, falls in love with an operating system, only to find out later that the operating system also has similar relationships with thousands of other human beings. This is a great disappointment to Theodore, who had hoped he was special to the operating system he felt he was in love with. Or consider an earlier film, *Eternal Sunshine of the Spotless Mind* (2004). In this film, a woman played by Kate Winslet uses an advanced memory-erasing technology to wipe out all memories of her romantic relationship with the male lead character, played by Jim Carrey. Carrey's character then tries to outsmart the memory erasing technology by finding a loophole back into the memory of his former partner, so that she can remember the romantic relationship they had together.

These are just three science-fiction depictions of how future technologies—humanoid robots, advanced operating systems, and memory editing technologies—might transform how we experience love and romantic relationships. Like many works of science fiction, the movies take a dystopic turn: the technologies they feature ultimately cause heartbreak and other forms of harm. Is this what we should expect of future technologies that are either designed for the romantic domain or that might be repurposed for that domain?

Our aim in this chapter is to reflect philosophically, not on science fiction technologies, but on emerging technologies in the real world that may reshape how people experience romantic relationships. In particular, we are interested in technologies that could plausibly change the way people think about love and perhaps the way they value love. We are also interested in how one might go about critically assessing such technologies and associated changes.

We are led to this topic in part by some of our own previous work, which includes research and writing we have done together as well as separately.[1] Our aim is not to reach a definitive stance on how to evaluate all technologically-mediated changes in how future people might relate to love. Our aim is rather to explore some ways in which emerging technologies might lead to such changes, and to articulate key responses one might have to these developments from our current point of view. The ideas we articulate in this chapter, then, are more abstract and theoretical than some we have articulated before. Even so, we will try to stay grounded by relying on concrete case studies and specific examples.

We'll start by explaining how one might conceive of love, focusing on romantic love in particular, followed by a sketch of the account we adopt for this chapter (section 1). We then discuss three different ways of critically assessing future developments in how people understand and value love (section 2). After that, we briefly explore how technologies can impact and change people's values (section 3) as

[1] Some of the writing we have done separately, in turn, has involved critical evaluations of one another's prior work. For example, Nyholm (2020) and Danaher (2019) have critically engaged with one another's views on the possibility of romantic or other meaningful relationships with robots; and Nyholm (2015a-b), Danaher (2013) and Earp (in Earp, Savulescu & Sandberg 2016 and Earp and Savulescu 2020) have critically engaged with one another's views on biomedical love enhancements.

a prelude to examining three specific kinds of technologies we have discussed in other essays: what we call "quantified relationship" technologies; biomedical love enhancements ("love drugs"); and robots and artificial intelligences with which—or more ambitiously, with whom—people might fall in love (section 4).

In section 5, we give some examples of how these three kinds of technology might potentially reorient how people think about and value love, raising important worries along the way. We then end by discussing whether—and if so, how—one might take a more positive attitude toward this possible future (section 6). We think there are many valid worries about emerging technologies intended for the romantic domain. But we will argue that there is also room for what we call *cautious optimism* about the technological future of love.

1: The Dual Nature of Love

What is love? Other contributions to this book explore the nature of love—what it is and how it should be valued—in greater detail than we can do here (cross references TBD). Still, we need to give some idea of how we conceptualize love for the purposes of our discussion.

Speaking generally, there are at least two main ways to get a grip on love. One approach focuses on those aspects of love that are amenable to scientific investigation. This might involve studies into such things as the neurochemistry of romantic attachment, the evolutionary history of human pair bonding, and the different stages of love that people go through (in terms of associated hormones, behaviours, and so on). An influential version of this approach has been taken by the anthropologist Helen Fisher and her colleagues (e.g., Fisher 2004). She describes and distinguishes lust, attraction, and attachment, investigates the different neurochemicals involved in each, and suggests that love can be primarily understood in terms of these biological dimensions.

Another approach is to see love as a psychological and sociocultural phenomenon: the sort of thing that is subjectively experienced in a certain way, and which has particular kinds of value within a given cultural or historical context. Here, you might think of love as it is depicted in art, plays, movies, songs, poetry, and even philosophy. From this point of view, what matters most is not particular neurochemicals or the evolutionary history of love's biological substrates. Rather, what matters are the ways in which people think about love, what people value about love, and the ways in which people grapple with love as a normative phenomenon. When philosophers write about love, it is usually this second approach—the approach that focuses on love as a valued psychosocial experience or a cultural ideal—that they pursue in developing their theories.

Now, you might think that you have to make a choice: either you try to understand love in the first, primarily scientific way, or you try to understand it in the second, value-laden way. But we think it is not only possible, but desirable, to take a dual perspective, where love is seen both as something that can be studied from a scientific point of view (here, neurochemistry and biology might be most salient) and

as something a bit more qualitative: a feeling or form of connection that is subjectively experienced in a given context, and that tends to be a source of significant value. According to this perspective, love is *both* biological and psychosocial, not one or the other.

This dual perspective has been defended by Carrie Jenkins (2017) in her recent book *What Love Is*. It is also the perspective that we adopt here (in line with Earp & Savuelscu 2020). Love, as we understand it, is partly something that has to do with certain brain chemicals and other things that scientists can study. And it is also something that philosophers, poets, and ordinary people who are not adopting a scientific point of view can be well-situated to reflect on and interpret (Earp, Do, & Knobe, in press). Like any other meaningful aspect of the human existence, love is best understood when viewed and interpreted through multiple lenses. So, in this paper, we are going to simply assume that love is a complex "biopsychosocial" phenomenon, some of whose aspects are best studied from a scientific point of view, and other of whose aspects are better understood from a more social, experiential, or philosophical point of view.

2: Love as a Value

Let's first consider love as a value. That is, let's consider it as something that people desire, plan their lives around, put high on their lists of priorities, and so on. We can make the following quick observations. First, even though many people will recognize that love has many positive side-effects or added benefits—it might make us happy, it might be good for our health and well-being (Wudarczyk et al. 2013)—love is not usually valued purely as a means to other goods. Rather, is usually also valued as an end in itself. When people (philosophers and others) assemble lists of the most important goods in life, love is often one of the things that ends up on those lists. Love, in other words, is often regarded as being intrinsically valuable (Nyholm 2015a-b).

Now, when people value love, they may have different ideas or associations regarding what love is or what it should be in order to qualify as the particular sort of good that it is. People often differ in the exact qualities they attribute to love, and these qualities may also evolve over time at a wider cultural level (Earp, Do, & Knobe, in press; Earp, Sandberg & Savulescu 2016, May 2011). Nevertheless, there are some ideas about love that are more common than others, at least in contemporary Western society, and these ideas crop up in various philosophical discussions of love, as well as in pop songs, poetry, and so on.

We will briefly share three such ideas (Nyholm & Frank 2017). First, love is often seen as having to do with the existence of a "good match" between lovers. Lovers sometimes feel, in other words, that they are "made for each other" (as in something like the notion of soul mates). Somehow, because of their shared values, interests, likes and dislikes, and so on, the lovers feel that they belong together, potentially to the point that each one feels that the other is their "other half." Second, love is often thought to involve two or more people mutually valuing one another for

the unique individuals that they are. They see each other as irreplaceable. By contrast, if someone is seen as being more or less fungible—able to be "traded out" or "traded up" if someone better comes along—this would likely clash with most people's intuitions about love as a means of valuing someone for who they are in particular. Third, many people associate love with a special kind of relationship, often characterized by some form of commitment. This can be a formal commitment like a marriage, or something less formal that still signals a sincere plan to stick by one another. Whatever type of commitment it might be, it is often thought that if people really love each other, they should be willing to be in it for the long haul: through thick and thin, in sickness and in health, and so on.

Now, when it comes to assessing possible future developments in how people might come to understand or value love, we can take a number of different approaches. One option is to compare these possible future ways of understanding and valuing love with the ways that love is understood and valued now (see e.g. Nyholm 2015a-b). According to this approach, if people come to care less about some aspect of love that is currently seen as important, or change the mode in which they experience or care about love, this might, from the current point of view, be seen as a loss or a failure to properly value love. For example, if people develop strong attachments to easily replicable robots or operating systems (as happens in the movies *Ex Machina* and *Her*), this might put pressure on the currently popular notion of "non-replaceability" as being an important criterion for what counts as love.

Another option is to look to other key values we hold currently, like the values of personal autonomy, or justice, or whatever it might be, and to assess whether the anticipated developments in love harmonize well with those other values. For example, if it one day becomes possible to manufacture an artificial lover from scratch or use love drugs to alter the strength or direction of your erotic desires, this could be seen as bringing love into greater harmony with the value of autonomy: we could now more easily choose the object and form of our romantic attachments (Earp, Sandberg & Savulescu 2014; Earp & Vierra 2018; Southan 2019; Thau 2020). On the other hand, putting love under the control of our own agency in this way might also seem abhorrent to many: it might seem to undermine the need for vulnerability, mutuality, and compromise in our relationships. Still, it is important to bear in mind how love, as a value, relates to and interacts with other things that we value, both now and in the future.

Finally, a third option would be to explore some combination of the two approaches we just discussed. We can look at how people understand and value love both from the current point of view (in terms of prevailing norms, values, and concepts surrounding love) and from the point of view of a broader range of values, such as autonomy or justice, that we might expect to maintain in the future. Accordingly, we might judge that some future development clashes to some extent with our present views about love while nevertheless harmonizing with our broader set of current or future values.

We favour this third, more holistic approach. We think that love can be regarded as a very important value in human life—even one of the most important values—but we also think that other values should be given weight, too. So, we think that the assessment of technologically-mediated changes to how love is understood and valued in the future should be guided not only by current norms and standards surrounding love, but also by other values we may hold or develop through time.

3: Technologies and Human Values

We have now said a few things about love, but we need to say more about technology. Peter-Paul Verbeek, among others, has emphasized that the technologies we use often have a major impact on human life (Verbeek 2011). But the nature of this impact is sometimes contested. According to what is sometimes called the "instrumental" theory of technology, technologies are simply tools that are used for particular purposes while being themselves entirely value-neutral. According to Verbeek, however, this view is simply mistaken. Instead, the technologies we use often significantly affect how we experience, perceive, and value things, including ourselves.

This can happen in various ways. For example, technologies often affect what we are able to do—which may expand the scope of what seems possible to us (Griffy-Brown et al. 2018; Sneltvedt 2018). They also affect what we pay attention to, or what becomes most salient in our experiences and perceptions of objects, events, and other beings in our environment. This, in turn, can affect what we value and how we value it. Consider the obvious example of social media technology. This technology allows us to consume large quantities of curated information and to communicate and interact with others in an instantaneous and almost frictionless fashion. It also increasingly dominates our attention and gives us a view of the world that is distorted along various dimensions. For example, the algorithms used to curate content on social media platforms artificially amplify our pre-existing biases and promote outrage and anger (Crockett 2017). They also encourage us to place increased importance on our social reputation in the digital world. All of this can affect our values. In particular, it can affect how we understand and appreciate ourselves and others, while facilitating increasingly polarised political interactions (e.g. Brady et al. 2020; Wu 2016; Williams 2018; Zuboff 2019).

Human values are also embedded in the technologies we use (whether by design or by accident), and this can reinforce certain values while undermining others (Verbeek 2011). For example, technologies that operate on the basis of massive amounts of data can lead to a data-based way of seeing the world. This can reinforce a scientific perspective, according to which the world may be quantified, measured, and explained in terms of deeper laws or principles. This in turn may lead to the quantification of things or experiences that would not otherwise have been captured in a numerical format. For example, academic research outputs are now commonly assessed using a variety of quantitative measures including citation counts, paper downloads, social media mentions and so on. These data are now automatically

captured by online algorithms and displayed in easy-to-digest forms, like scores or charts. In turn, academics are increasingly liable to see their "output" as assemblies of numbers and to locate their self-worth in those assemblies. The volume and availability of the data encourages them to fixate on the numbers and try to increase their 'score' in order to improve their ranking within the academic 'game' (Bakker et al. 2012; Muller 2018).

To summarize, when new technologies emerge, or when existing technologies are developed in certain ways, this can change the way we experience and perceive the world, and it can also change what we are able to do and what we can imagine. These changes can also affect what we value and the ways in which those things are valued (Danaher ms.). Of course, values sometimes also change or evolve over time for other reasons—for example, because of revolutions in wider social norms or because of the introduction of new ideas into society (Baker 2019). But one important driver of change in human values is the introduction of new technologies, as well as developments in the technologies we have.

What does all this have to do with love? The points we have raised here are not *unique* to love; rather, they apply to many if not all major aspects of human life that can be affected by the development and introduction of technology. But since love is the part of life we are concerned with in this chapter, let us now focus on some more specific technologies that seem likely to influence how people understand and value love.

4: Three Classes of Technologies the Might Change How We Understand and Value Love

In previous work, both separately and together, we have explored various types of technologies that are either designed for the romantic domain or which seem likely to have significant effects within it (e.g. Danaher, Nyholm, & Earp 2018a-b; Nyholm 2015a-b; 2020; Nyholm & Frank 2017; 2019; Danaher 2019a and 2020a; Earp et al. 2012; Earp 2019; Earp & Savulescu 2020; Earp & Gander 2020; Earp & Grunt-Mejer, 2021; Sterri & Earp, in press). We will focus on three broad classes in the remainder of this chapter, each of which has features that make it likely the technology will affect how people experience and think about love, including the range of possibilities for love they can imagine:

> 1: What we call "quantified relationship" technologies: technologies used to track, log, or quantify various different aspects of romantic relationships. Basically, these are akin to "self-tracking technologies" but applied to love and sex. Among other things, these technologies might generate quantifiable data about our romantic relationships or sexual experiences or even gamify aspects of these, thereby directing our attention towards those aspects of our intimate lives that are amenable to quantification (Danaher, Nyholm, & Earp 2018a-b).

2: So-called love enhancement biotechnologies, or what one of us has called "love drugs" for short: drugs or other technologies that would act on the biological dimensions of love in order to influence lust, attraction, attachment or other aspects of our romantic lives (Earp & Savulescu 2016, 2020, in press). These drugs might be used to sustain or improve relationships that are worth maintaining ("pro-love drugs") or to facilitate the end of a bad relationship, or the recovery from it ("anti-love drugs"). Currently, it is only the side-effects of existing medications used for other purposes that seem likely to promote such outcomes. But newer research into drug-assisted couples therapy, using MDMA ("ecstasy") or psychedelic drugs such as "magic" mushrooms, shows another way in which chemical interventions into love may one day affect our relationships (Earp & Savulescu 2020, in press; Earp & Gander 2020).

3: Humanoid robots and avatars intended for sex or romantic partnership with humans. Interestingly, while many so-called sex robots are being created for overtly sexual purposes, some of the most well-known companies developing such robots are beginning to market these robots as "true companions," that is, as entities that can engage emotionally with the user and serve as a form of romantic partner (Nyholm & Frank 2017 & 2019; Nyholm forthcoming; Danaher 2020; Earp & Sterri in press).

These are all examples of technologies that either by design or for other reasons may have major impacts on how people experience and perceive love, as well as what they pay attention to, what they are in fact able to do, and what they can imagine within romantic domain. As such, they have the potential to shape or reshape how people understand love and what they value about it. We will now explore some ways in which this might happen. We will start with some potential changes that might be viewed as negative or worrisome from the point of view of how love is currently understood and valued. In the section after that, we will explore a more positive vision about the potential of these technologies.

5: Worries and Potential Objections to the Technological Future of Love

There are a *lot* of worries one might have about the technologies we have just mentioned. We cannot cover them all in this chapter. But here are some of the worries that might be seen as especially salient, pressing, or vexing:

Quantity over quality: one key worry that applies to technologies that track, log, or otherwise quantify different aspects of romantic relationships is that they might motivate an excessive focus on those particular aspects of loving relationships that are actually measurable or quantifiable in the first place. This might detract from important qualitative aspects of love and romantic relationships, which are perhaps among the most important aspects, but harder to measure and quantify. For example, the rate at which someone sends

text messages containing certain words, or the number gifts someone buys for a partner, can easily be tracked and recorded in terms of numbers. But key aspects of tenderness and loving care for one's partner—the way in which we might make someone feel special and loved, or take pleasure in one another's company—are much harder to meaningfully measure or quantify. By funnelling our attention towards that which can be tracked, measured, and quantified, quantified relationship technologies can be seen as underemphasizing and perhaps interfering with key qualitative aspects of love and relationships that are typically seen as very important (Danaher, Nyholm & Earp 2018a).

Evaluative category mistake: In previous work, one of us (Nyholm 201a-b) has objected to the idea of using love drugs—or, rather, to some arguments that have been presented in the literature in favour of love drugs (e.g. in Savulescu & Sandberg 2008)—by arguing that the use of such drugs might promote an overly narrow, instrumental, and medicalized way of valuing love. As we noted above, love is commonly valued today as an end in itself. But once one starts thinking about the prospect of developing drugs to "treat" problems related to love, there is a risk that romantic relationships will be "pathologized" or seen primarily as a means to other ends, such as health or longevity. In this way, attempts to deal with various challenges in relationships might shift from taking a holistic perspective that incorporates the values of the partners, to a more reductive or "one size fits all" medical lens (Nyholm 2015a-b; Earp, Sandberg & Savulescu 2015). Insofar as love is appropriately seen as an end itself, by contrast, such shifts would count as an evaluative category mistake: that is, framing love as a mere instrument to other goods, when that is not how it should be framed.[2] Relatedly, even if it is possible to see love as being valuable both for instrumental and intrinsic reasons, the impact of the technology might tilt the balance more the former than the latter. This could result in an impoverished understanding of the intrinsic value of love.

Superficial behaviourism: When it comes to the idea of creating robots or avatars ("virtual girlfriends or boyfriends") that are supposed to serve as romantic companions to people, one potential worry is that this will put too much focus on outward behaviour while deemphasizing the importance of people's inner feelings about each other. It is commonly thought that a major part of love's value is that it is rooted in mutual care and being seen and appreciated for the particular individuals that we are. This, in turn, seems to presuppose that our lovers have an inner life (thoughts, feelings, motivations, and so on) of a sort that robots presumably lack. So, when companies build sex robots that are also supposed to function as romantic partners for people, this

[2] For a critical response to this worry from one of us, see Earp, Sandberg and Savulescu (2016).

> might get people to think about love primarily in terms of outward behaviour while undercutting the role of feelings and motivations that are currently thought to be central to what love is.[3]

These are just three examples of the kinds of concerns one might have about the technological future of love—one for each class of technology we mentioned above. There are, of course, many more kinds of worries that could be raised about each technology, including concerns about privacy, health risks, harms to vulnerable populations, and deception (e.g., users might be tricked into believing that technologies have capacities they do not have). For discussions of these and other, further worries, we recommend the references here (Arrell 2018; Aurenque & McDougall 2013; Cox-George & Bewley 2018; Danaher 2017, 2019; Delmas & Aas 2018; Gupta 2012; Nyholm & Frank 2019; Richardson 2015; Scheutz 2012; Sharon 2016; Sparrow 2017; Veliz 2020). But rather than going through a longer list of possible worries in this chapter, we also want to talk about how one might respond to these and related worries if one adopts an attitude of cautious optimism about the technological future of love.

6: Easing Some of the Worries

How might one respond to the sorts of worries we raised above? One possible response is to identify a number of risks along the lines we mentioned, and to then argue that, because of these concerns, we should simply ban the development or use of such technologies. In other words, we should regard them as on the whole undesirable or impermissible, either intrinsically or in terms of likely consequences. Indeed, when it comes to the third kind of technology mentioned above—humanoid robots developed to potentially serve as romantic partners for human beings—this is exactly the response that some authors have argued for.

For example, in a powerful critique of humanoid sex robots, Kathleen Richardson (2015) argues that such robots will inevitably represent something highly objectionable, that they are likely to reinforce negative stereotypes (especially about women), and that they will corrupt the relationships between human partners. In particular, she argues that the current motivation to create such technologies is grounded in a desire to have the technological equivalent to a sex worker-client relationship. Since all such relationships, in Richardson's view, are exploitative and promote objectification, this is likely to encourage people to adopt such attitudes to human relationships too. For these reasons, Richardson concludes that humanoid sex robots ought to be banned.

[3] Two of us have discussed the issue of outward behaviour versus inner states in much greater detail elsewhere. For a defense of the possibility of meaningful relationships between humans and robots in terms of what one of us calls "ethical behaviourism," see Danaher (2019 and 2020). For critical discussion of the possibility of meaningful human-robot relationships, see Nyholm and Frank (2017) and Nyholm (2020).

In a similar vein, one could argue that quantified relationship technologies or love drugs should be banned because they would predictably promote undesirable relationship outcomes or conceptions of romantic love: for example, the idea that relationships are like games that one should try to win, or that love is only valuable insofar as it is good for our physical health and well-being.

We disagree with this way of responding to the sorts of concerns we considered above. For example, we have criticised Richardson's specific arguments about humanoid sex robots at some length in the past, for reasons we will shortly explain (Danaher, Earp and Sandberg 2017). Furthermore, we disagree amongst ourselves about the strength of similar worries as applied to other technologies, like love drugs, with some of us being more worried than others (see e.g. Nyholm 2015a-b; Earp, Sandberg & Savulescu 2016; Nyholm & Frank 2017; Danaher 2020). But what we share is a conviction that the prospect of negative outcomes associated with a new technology is never by itself a knock-down argument against it, much less a sufficient reason to ban it.

Let us just grant that the concerns we considered above, and other similar objections, have some or even significant force. We think it possible to recognize this fact without leaping to the cause of prohibition. Rather, objections should be taken into account and reckoned with in the development, use, and perhaps regulation of technologies for the domain of love and romantic relationships (see e.g. Danaher, Nyholm & Earp 2018a). In other words, we should seek ways of counteracting or balancing out any predicted bad effects, rather than simply banning the class of technologies altogether. Where there are worries and concerns, these can be viewed as calling for improvements and new designs, and not necessarily as total stop signs to development. That being said, we are not in principle opposed to prohibition in certain cases.[4] If the risks of a technology are sufficiently great, and the means of mitigating those risks sufficiently feeble, it may sometimes be better to try to stop it from coming into existence. But given the possible goods that new technologies may also bring, if appropriately managed, used, and regulated, complete prohibition should generally be a last resort, rather than a first.

Moreover, when we step back from current ideas about the value of love, and consider a broader range of values, we may find that certain technologies could help to promote or fulfil some of those other values. For example, as we noted earlier, some of these technologies might allow us to exercise greater agency in the romantic domain, and this need not necessarily rob love of all its value. Rather, it might allow us to see love in a new way, while fostering our ability to shape our lives in accordance with our own views about what a good life is. As one of us has argued elsewhere (Earp & Savuelscu 2020, pp. 188-189):

> Many people are delighted to be swept off their feet in the early stages of a romantic relationship, and just as devastated, later on, when those ebullient

[4] For example, one of us has discussed whether there might be a case in favour of banning sex robots that are designed to look and act like children (Danaher 2019b).

> feelings start to fade, seemingly out of nowhere and outside of their control. They might even misattribute their changing feelings to something wrong in their partner (or the relationship) and go rushing into a breakup or divorce. … But what if the problem is not so much in their partner or the relationship, but at least partly in their concept of love? What if to love is to practice an art … which requires conscious effort and discipline, as well as knowledge and therefore understanding? What if knowing how love works [and even sometimes actively altering] the chemicals between us, could help us be better at being in love?

One reason why we might favour such an approach is that it makes room for individual differences in values about love and relationships. As we noted, there is some broad agreement about what is desirable above love, including its being a powerful source of mutual care and affection. But there is not one relationship model that suits everyone equally well. Part of what it is to flourish in the domain of love and romance is to find a relationship model that suits oneself and one's partner(s). Accordingly, we should avoid a "one size fits all" mentality in this important life domain (Danaher, Nyholm & Earp 2018a; Earp & Savulescu 2020).

Emerging technologies will no doubt change, to some extent, the ways in which people understand and value love. And from the point of view of how we currently value love, this might very well imply certain losses. We may also need time to adapt to technological changes so that we can update our values in a way that still allows us to flourish in our relationships. So, for example, we might try to avoid overly abrupt technological developments: the introduction of information and communication technologies, say, that suddenly and drastically alter what people are able to know about each other; or cases where most users neither understand how the new technologies work nor the business models behind them. These kinds of situations may involve many unforeseen side effects that will be found to be undesirable and regrettable. Accordingly, it might make sense to adopt a sort of "moderate conservatism" toward the pace at which experimental technologies are introduced in this domain (Danaher 2016).

At the same time, we have to remember that our current ways of valuing certain goods—whether it be romantic love or some other important aspect of our lives—may make it hard to see the potential value in alternative ways of being and relating. So, we should not be too quick to dismiss as undesirable the ways in which people's understandings of love and relationships may evolve, even if we are sensitive to the possible risks of such evolution.

Love and relationships can be great sources of happiness and value for many people, but they can also be causes of much frustration, heartbreak, pain, and suffering (Earp et al. 2013). This is another reason why it can make sense to explore ways of better understanding love and developing technologies that might enable us to exercise more agency and control in this domain. Most relationships have their ups and downs. But some relationships have too many downs and not enough ups. And

some people have trouble establishing romantic relationships in the first place. Given that this is so, we should explore the technological future of love, not only with a critical and sceptical eye, but also with an eye to how we might relieve or avoid some of the worst (or most unnecessary or disvaluable) sources of frustration and suffering in this domain.

7: Concluding Remarks

We think there is a case to be made for what we call cautious optimism about the technological future of love (Danaher, Nyholm & Earp 2018a). To be sure, it is easy to come up with concerns and worries about this future, and there are genuine risks involved that should not be ignored. Moreover, as we remarked in the introduction, science fiction is full of dystopic scenarios in which imagined technologies of the future create heartbreak and problems for people looking for love and companionship. Whether we are envisioning manipulative robots making people fall in love with them (as in *Ex Machina*), operating systems breaking people's hearts (as in *Her*), or memory editing technologies creating problems for couples (as in *Eternal Sunshine of the Spotless Mind*), it is often easier to come up with imagined scenarios in which things go wrong than scenarios in which things go right.

Part of the reason for this asymmetry is that love is a complex phenomenon with biological, psychological, and sociocultural aspects that make it hard to properly grasp or understand. As with any complex system whose inner workings remain largely mysterious to us, it often *is* easier to mess it up than to improve it (Bostrom & Sandberg, 2017). This is why our optimism about the technological future of love is tempered by caution. In order to justify this stance, however, it is important to avoid both wishful thinking ("everything will work out fine") and knee-jerk opposition to change ("we should just ban potentially risky technologies"). Instead, what is needed is the very kinds of conversations that the burgeoning field of the ethics of technology—here applied to love and romance—is prompting and helping to develop. Which is to say, these discussions, to which we hope to be meaningfully contributing in some small way, are precisely what is needed to make a more optimistic future possible. [5]

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