

Twins: A cloning experience

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Abstract

Drawing upon qualitative interviews with monozygotic (identical) twins sharing 100% of their genes, and with dizygotic (fraternal) twins and singletons as control groups, this paper explores what it means to be genetically identical. (The twins interviewed were from the TwinsUK register in London.) In the context of the ongoing debate on human reproductive cloning, it examines questions such as: To what extent do identical twins perceive their emotional and physical bond to be a result of their genetic makeup? What would they think if they had been deliberately created genetically identical? How would they feel about being genetically identical to a person who was born a few years earlier or later? First, our respondents ascribed no great significance to the role of genes in their understanding of what it means to be identical twins. Second, the opinion that human reproductive cloning would “interfere with nature”, or “contradict God’s will”, was expressed by our respondents exclusively on the abstract level. The more our respondents were able to relate a particular invented cloning scenario to their own life-worlds, the lower the prevalence of the argument. Third, for all three groups of respondents, the scenario of having been born in one of the other groups was perceived as strange. Fourth, the aspect that our respondents disliked about cloning scenarios was the potential motives of the cloners. Without equating monozygotic twins directly with “clones”, these results from “naturally” genetically identical individuals add a new dimension to what a future cloning situation could entail: The cloned person might possibly (a) perceive a close physical and emotional connection to the progenitor as a blessing; (b) suffer from preconceptions of people who regard physical likeness as a sign of incomplete individuality; and (c) perceive the idea of *not* having been born a clone of a particular person as unpleasant. © 2006 Elsevier Ltd. All rights reserved.

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Introduction

The topic of human reproductive cloning (HRC) has spurred human imagination for decades. Mostly, the images conjured up consisted of dark and ominous portrayals of megalomaniac scientists unleashing catastrophe (Battaglia, 1995; Hopkins, 1998; Nerlich & Clarke, 2003). Clones are often envisioned as

helpless—sometimes also as soulless—victims of human vanity. Voices from the pro-cloning front, on the other hand, have been mostly dominated by esoteric groups such as the “Raelians” who uncritically applaud cloning research (Bozeman, 1999).

In the academic debate, the main arguments presented against HRC can be summarized along three lines (although their fundamental themes partly overlap):

1. *Interfering with nature:* The argument here is that HRC would represent an act of interference with

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the “nature” of reproduction and creation. The “playing-God” argument is a variant of this claim (for discussions, see Bartlett, 2005; Evans, 2002).

2. *Human dignity and compromised individuality:* The principle rejection of HRC is based on the fear of duplicating genetic traits (because of a fear of eugenics—only “good” traits will be duplicated—or “cloning armies of soldiers” [The Wellcome Trust, 1998]).¹ Often, this argument is accompanied by the claim that the production of a human being genetically identical to another, already existing human being would violate human dignity (discussed in Burley & Harris, 1999; Harris, 2004) and/or that cloning would deprive the cloned individual of the “right to an open future” and therefore compromise his or her potential for individuality (discussed in Evers, 1999; Feinberg, 1992; Kuhse, 2001). Furthermore, some authors contend that HRC would “commodify” children, or instrumentalize them (see Meilaender, 2000).
3. *Social relations:* The third line of reasoning opposing HRC focuses on the fear of a relationship between the “produced” (the cloned person, the clonee²) and the “producers” (the social parent[s] and/or the progenitor parent of the clonee) that is fundamentally different from the parent–child relationship as we know it, because the “producers” would have the power to deliberately determine the genetic traits of the former (Habermas, 2003). This claim is often intertwined with the fear that HRC would confound social relationships (O’Neill, 2002).

In addition, there is a range of anti-HRC arguments which have been left out of this introductory overview; namely, those which are not directed at HRC *in principle* but concern only certain aspects of it. The safety argument is an example: Its proponents hold that HRC should be banned because of the numerous health risks which it would involve for both the gestational mother and

the potential clonee. Furthermore, we did not include anti-HRC arguments that warn of potential discrimination of non-“clones” (see Levick, 2004, p. 185) and/or a segregated society in which naturally conceived individuals with “inferior” genetic material represent a new underclass (we do, however, address such arguments wherever they were mentioned by our interviewees). These arguments are certainly important, but they are used against many new medical technologies and are not particular to the discussion on HRC. The same is true for the claim that money spent on cloning research would be better—and more socially justly—spent otherwise (for a discussion of this argument, see McCarthy (1999); for a critical discussion of HRC in the context of a prevalent technocratic consciousness, see Bowring (2003)).

Recently, bioethicists have started to question the claim that cloning would be unethical in all cases (see for example, Strong, 2005), and an increasing number of authors suggest leaving open the option of allowing HRC if the procedure has become safe for the gestational mother and the clonee (Blackford, 2005; Harris, 2004; Levick, 2004). Despite prominent voices which still insist on the intrinsically immoral nature of HRC, it is being increasingly reframed as simply another technology with potential advantages and potential hazards.

In discussions of the ethics of HRC, one aspect has been missing almost entirely: the embodied experience (see Davis & Davis, 2006) of people who are genetically identical. Drawing upon the work of Merleau-Ponty (1962), we use the notion of embodiment in order to emphasize that it is always through our bodies that we engage with the world, rendering the complete detachment of mind/spirit from the material substrate impossible (see also Barral, 1965; Csordas, 1994). Looking at the embeddedness of theoretical concepts such as “human dignity” and “genetic sameness” in the practical and embodied experience of human beings is a necessary step to fully understand their meaning on the theoretical level.

Whereas it is obviously impossible to bring the experience of cloned human beings into the debate, monozygotic (MZ twins) come as close to a HRC scenario (defined as the creation of fully fledged human beings by a procedure called “somatic cell nuclear transfer”, SCNT³) as possible. Identical

¹The fear of eugenics, and of somebody “cloning armies of soldiers” is of course not only relevant with regard to individual human dignity but also translates into a concern at the collective level (fear of harm to society).

²We use the term *clonee* in reference to potential people born through somatic cell nuclear transfer (SCNT; see endnote (iii)), because of the derogatory connotation carried by the word “clone”. We resort to the term “clone” only in the context of particular arguments in which this word is used.

³“Somatic cell nuclear transfer” entails the transfer of the nucleus of a somatic cell into a denucleated ovum, thereby

twins, as they are referred to in non-medical contexts, display the characteristic of genetic sameness, which is central to the debate on HRC. They stem from splitting of the same fertilized egg and therefore share 100% of their genes.⁴ This, however, does not mean that identical twins are the same as “clones”—created through SCNT and implantation—in every aspect: There are both important similarities and differences between the two. A relevant difference is, first, that “natural” identical twins are a product of chance, while “clones” would be the product of a conscious act by humans. Second, the number of identical twins is limited by the number of embryos a woman can carry to term, while the number of potential “clones” would (theoretically) be unlimited. Third, MZ twins have two biological parents, while clonees would have a progenitor from whom the somatic cell was taken and with whom they would share their genetic makeup. In addition, clonees would have a gestational mother and a (set of) social parent(s). All these roles can overlap (depending, for example, on whether the ovum stems from the same person as the somatic cell, etc.). As twin researcher Nancy Segal (2000, p. 225) points out, clonees would “fail to fulfill the three twinship criteria: simultaneous conception, shared prenatal environments, and common birth”.

While opponents of HRC emphasize the differences between MZ twins and “clones” in order to uphold that cloning is morally wrong, others focus on the similarities between the two situations and contend that if it could one day be safely achieved, there would be nothing wrong with cloning: “Identical twins provide sturdy proof that inevitable difference of nurture [...] guarantees the individuality and personhood of each human clone” (Gould, 1998, p. 48). Identical twin Douglas Dunne (1998) states in an essay published on the internet that “[c]loning only seems ‘creepier’ than twinning is—because it is a novelty. This whole outrageous

outcry has been an insult to all identical twins” (see also Macintosh, 2005).

As mentioned before, it is the characteristic of genetic sameness which renders the situation of identical twins important in the context of the debate on HRC. Whereas the experience of identical twins does certainly not allow for a detailed projection of what the lives of clonees would look like, it can shed light on questions such as: To what extent do genetically identical individuals perceive themselves, and their mutual bond, to be a result of their identical genetic makeup? Would it make a difference to them if they had been deliberately created as genetically identical by their parents? Does the fact that the “clone status” of identical twins is due to chance, and not due to choice, mean anything to them? And, how would they feel about having somebody with the same genome who was born a few years earlier or later?

Drawing upon 17 interviews conducted with MZ and dizygotic (DZ, or fraternal) twins and singletons in the fall of 2005, this article discusses the experiences of identical twins in the context of the main anti-HRC arguments. Our objective is not to determine whether these arguments are right or wrong, but to enrich an important theoretical debate with the experience of genetically identical people. This, we believe, is a crucial step for a better understanding of some of the possible thoughts and emotions of future cloned individuals.

Methodology

In the fall of 2005, the first author (BP) conducted semi-structured narrative interviews with seven pairs of MZ twins and four pairs of DZ twins from the TwinsUK registry at the Twin Research and Genetic Epidemiology Unit at St. Thomas’ Hospital in London, UK (www.twinsUK.ac.uk). In the group of MZ twins, all pairs but one were interviewed together. In the group of DZ twins, all pairs were interviewed together. After we tried interviewing twins separately, we found that talking to them together generated more insights for our study as we could observe the mutual development and negotiation of stories and viewpoints. In addition, twins interviewed separately were more reluctant to articulate critical thoughts about the relationship with their twin sister/brother and the twinship experience as such, perhaps because they felt they should “protect” their twin sister/brother in the presence of the researcher.

(footnote continued)

replacing the genetic information of the original germ cell with the genetic information of an already existing individual.

⁴Identical twins are even “more” genetically identical than many “clones” would be: In a cloning scenario, if the donor ovum came from a different person than did the nucleus of the somatic cell, the mitochondrial DNA in the cell mass of the donor egg would add to the genetic information of the nucleus in the somatic cell. The result would be a clonee who is genetically *virtually* identical with the donor of the somatic cell but also carries a very small number of genes from the donor of the ovum.

An additional interview was conducted with a female DZ twin whose sister could not be interviewed. Because the UK sample did not include DZ twins of different sex, a male person with a female DZ twin sister was interviewed in Austria 3 weeks later. Three non-twin siblings, who were outpatients at St. Thomas' Hospital Rheumatology Clinic, were interviewed as part of the control group. This totals 17 interviews with 27 individuals lasting between 20 and 90 min. The interviews were transcribed and analyzed. The entire research process was guided by principles of the Grounded Theory approach (Glaser & Strauss (1967), in the tradition of Charmaz (1990). See also Charmaz (2000)). The interview questionnaires were developed according to Weiss (1995) and consisted of three categories of questions: part A concerned the family background, upbringing, and the life-course of our interviewees; part B focused on the relationship of the respondents with their twin sisters and brothers; and part C confronted the respondents with several thought experiments about the use of new medical technologies and cloning.⁵ We did not organize the research questionnaire along the main lines of anti-cloning arguments as discussed in the introduction. Instead, we asked open questions related to our respondents' twin-(or sibling-)ship experience and let them lead us into fields and themes that they deemed worthy of discussion in this context. Only after a first evaluation of the interview data (in which we identified prevalent themes and arguments) did we order answers according to the three dominant themes in the HRC debate. The use of the word "cloning" was avoided during the first and second phase of the

⁵Parts A and B focused on the actual experience of our respondents with being an (identical or fraternal) twin or singleton in various contexts (family, educational institutions, professional context, partnership, parenthood, etc.). Questions were open-ended and encouraged respondents to tell stories and share experiences, in order to generate insights about the meaning of particular theoretical concepts in the daily life of the interviewee (for example, MZ twins were asked: "Have you always known that you were 'identical' twins?", and answers were followed up by questions about the underlying reasons or rationales employed by respondents). Part C of the questionnaire dealt with hypothetical scenarios which were typically introduced by asking respondents what they would think if they were in a particular situation, or what they would think *about* a particular situation (for example, "Let's do a thought experiment: If you lost a child, or another beloved person due to an accident, and you had the possibility to use that person's DNA to create another person who is genetically identical to him or her, do you think you would consider doing it? (*follow up: why*)").

interview, in order to prevent respondents from reacting primarily to the media coverage of the topic instead of drawing upon their own experience. Only in the third phase of the interview were respondents asked about their opinions on new medical technologies, and, if they did not mention it themselves, about cloning specifically. The questionnaires for DZ twins and singletons were adjusted versions of the questionnaires for MZ twins. All respondents signed informed consent forms prior to the interview (questionnaires can be obtained from the first author).

All but the Austrian respondent were registered in the TwinsUK database at St. Thomas Hospital. All but one (Jewish) respondent were North European Caucasian Christians; only three out of 27 respondents considered their religious beliefs "very strong"; the self-assessments of others varied between "not religious at all" and "somewhat religious". All names and possible identifying information (such as place names, exact age, etc.) of our respondents were changed.

The research design has an obvious limitation as all but one of our interviewees live in the UK. Therefore, we cannot assess to what extent attitudes and opinions about future genetic technologies are culturally determined.⁶ In addition, all but three interviewees were female, which might influence the attitude to medical technologies in general (as women are believed to be more skeptical of new medical technologies than men; see Napolitano and Ogunseitan (1999)). The fact that all but one of our twin respondents were already registered in a twin research database could bias the sample insofar as it might indicate a more positive experience and understanding of twinship in our research sample as compared with the general twin population.

Cloning would mean to interfere with nature, or to "play God": What the twins say

In the literature on HRC, the argument that HRC interferes with nature appears in many variants. Most authors contend that HRC, as a modus of asexual reproduction (because it does not involve the fusion of an egg and a sperm), would "mock

⁶With regard to attitudes towards biotechnology in the UK, see Eurobarometer surveys, <http://europa.eu.int>; Costa and Mossialos (2003), and Calnan et al. (2005). In a European comparison, UK citizens neither belong to the skeptics nor to the most fervent supporters.

nature” or put humans into a situation of “playing God” in the sense that they would not leave reproduction up to chance but assume the role of the creator, which is seen as morally reprehensible, or dangerous (The Wellcome Trust, 1998; Evans, 2002).

In our interviews with twins, we analyzed all statements relating to transcendental themes (“God”, “spirit”, but also “nature”) in this context. Interestingly, phrases such as “contradicting nature” or “playing God” were not brought up very often; if they appeared in the conversation, it was mostly in response to abstract questions, such as whether or not parents should be allowed to determine their future children’s genes, or what medical technology should be prohibited by law. Only three respondents, none of whom was an identical twin, mentioned “interfering with nature” or “playing God” in connection with cloning. Identical twins Alexis and Saffi, aged 32, implicitly contrasted cloning with “natural” reproduction but explained that it would not matter to them whether they had been conceived as identical twins by chance or by choice:

Alexis: “I don’t think so, no...”

Saffi: “You don’t?”

Alexis: “I don’t think it’d bother me, actually. That wouldn’t change the way we are at the end of the day, whether we were created by a way of selecting genes, or whether we were created naturally. It wouldn’t affect who we are, and what we are.”

Saffi: [in agreement:] “No.” (I 4)

The theme of cloners assuming the role of the creator was not mentioned at all. Referrals to a divine plan were often made to express that a certain procedure was *not* against God’s will. Karen, an identical twin of 73 who considers herself religious, explains: “If He has put it into people’s minds to be able to do this, perhaps it’s His way” (I 7).

Some respondents objected to the idea of people deciding about the genetic characteristics of their potential children, and mentioned the “interfering with nature” argument in this context. Identical twin Gerald, aged 38, told us that he found it “frightening” to think that people could decide how they have their kids (as identical twins, as fraternal

twins, or as singletons): “We’re talking about the beautiful idea of nature and the unknown... [...] Take away that beauty, that essence, that surprise, the unknowing! [...] It’s frightening, I think” (I 13). Emma, an identical twin of 36, also referred to nature when asked whether parents should be allowed to decide how they have their children: “People could choose to have identical or non-identical twins? No, *one should let nature take its course*” (I 12, emphasis added).

The continuation of the conversation with Emma and her twin sister Amanda pointed towards another interesting aspect of the “interfering with nature” and “playing God” argument. When asked what they might have thought if they had been born as a singleton but if their parents had loved one of them so much that they had decided to have another child genetically identical to her, Emma and Amanda wavered:

Amanda: “I would say no. I think it’s odd to me. Because that’s human cloning in a sense, isn’t it?” [...]

Emma: “Because you know, even though we’re identical twins, we’re very individual.”

Amanda: [...] “The poor child would always be compared. [...] The positive of one of them would always be compared to the negatives of the other.” [...]

Emma [to her sister]: “But how would you know? You never know unless you are in that situation!” (I 12)

Emma breaks out of the abstractness of the topic by stating that one cannot really know if one has not experienced a situation oneself. She implies that personal experience in connection with a particular topic—in the sense that one has experienced a situation with its physical, emotional, and psychological aspects—renders a person competent to make a valid argument in the debate on that topic.

The “interfering with nature” and “playing God” arguments seem to be examples of considerations which disappear as soon as abstract theoretical concepts are filled with meaning derived from practical experience. Our respondents mentioned nature, or referred to a certain technology or procedure as being against God’s plan, only when they were confronted with abstract scenarios or questions such as: “Should parents be allowed to

determine the genes of their children?”, or “Should cloning be prohibited?” When given a concrete description of a HRC scenario which entailed some characteristics of their own life-worlds, their answers became much more complex. This became especially obvious when our respondents were asked whether they would consider replacing a deceased loved one with a person genetically identical to him or her. June, a 19-year-old identical twin who had voiced her disapproval of parents “picking” their children’s genes earlier in the interview, pondered whether she would consider “replacing” her boyfriend if he died:

Yes and no really. No because obviously, if you lose a loved one, no one can ever replace him. [...] Yes for people who lost him through an illness or an accident. [...] It would be sort of nice to bring him back sort of thing (I 16). Or somebody who looks like him.

Mildred and Elsa, fraternal twin sisters aged 61, disagreed about whether or not it was right for Elsa to consider “replacing” her deceased daughter:

Elsa: “I would, if it wasn’t illegal.”
 Mildred: “But I would not. [...] Would you want another baby to be similar to the one that’s gone?”
 Elsa: “Yeah, I think so...I said I’d think about it. [...] It’s not the same person, only the body. (I 5)

At a concrete level, all of our respondents had a good understanding of the difference between having the same genes and being the same person. This leads us to the second line of argument which is commonly used against HRC: that producing a person genetically identical to another could compromise individuality, and represent a breach of human dignity.

Infringement of human dignity and compromised individuality: What does it mean to be genetically identical?

Supporters of the claim that HRC would contradict human dignity often base their arguments upon two characteristics of HRC: First, that HRC is a form of asexual reproduction because it does not

involve the fusion of an egg and a sperm and therefore not result in a child which carries (parts of) the genetic information of two parents (for a discussion of this claim, see Silver (1998)). Second, the production of a human being genetically identical to another already existing human being is seen as problematic. Whereas a cloning scenario is believed to pose a variety of threats to human dignity (such as instrumentalizing the clonee; see, for example, Council of Europe (1998)), the most prominent one, according to many authors, would consist of compromising the individuality of the clonee. Ian Wilmut, the creator of the world’s most famous—though not human—clone, Dolly the sheep, doubts “that a clone would necessarily have the same opportunity for individual development as a child produced by sexual reproduction” (Wilmut, 2001; see also President’s Council on Bioethics (PCB) (2002)). The General Assembly of the United Nations, in its “Declaration on Human Cloning” (United Nations’ General Assembly (UN-GA), 2005), calls for national governments to ban human cloning because it is seen as “incompatible with human dignity” (paragraph a). Part of the rationale underlying this claim is the concern that a person who has purposely been created genetically identical with another person is likely to suffer from greater difficulties in developing an individual identity than naturally conceived persons. This would be the case not only because of the identical genetic makeup *per se*, but also because of the particular expectation that the clonee would be confronted with (for example, the expectation that the clonee would develop in a similar way as the progenitor). In addition, some of these concerns seem to arise in analogy to instances where deficient identity formation and deficient individuality has been attributed to twins (for an excellent discussion of issues related to identity formation in twins, see Stewart (2003). See also Burlingham (1949), Hartmann (1964), and Winestine (1969)). Turner has explained this phenomenon by pointing to the challenge that twins, due to their very existence, pose to conventional understandings of single and autonomous individuality: “[T]winship presents the paradoxes that what is physically double is structurally single and what is mystically one is empirically two” (Turner, 1969, p. 45; see also Schapera, 1927; and Stewart, 2003, p. 25). Simultaneously, also in relation to psychoanalytic concepts of identity formation which focus on single individuality, twins are “inevitably anomalous” (Stewart, 2003, p. 63).

A similar conceptual challenge seems to be inherent in scenarios of HRC.

Others have argued that the claim of HRC compromising individuality can only be upheld if one endorses a crude genetically deterministic attitude which equates human beings with their genes (Macintosh, 2005; Revel, 1998). If we maintain that genetic makeup plays only a limited role in determining people's personalities and identities, what grounds do we have to believe that having the same genes as somebody else (even if the progenitor was the clonee's social mother or father) would have a significant impact on both the identity of a person and on the relationship between a clonee and his or her progenitor?

As mentioned above, none of our respondents employed strong genetically deterministic views. Here, too, however, we found a difference between what our interviewees stated at the abstract level, and how they described their experiences and understandings at the concrete level of personal life contexts. Identical twins Orna and Marilyn provided us with a good example for this seeming contradiction. Confronted with the word "cloning", Orna reacted skeptically: "I don't think people should do that. Because a child is an individual. Because everybody is an individual" (I 3). Earlier in the interview, when the sisters had been asked whether they thought that if they had had twins themselves, it would have made a difference whether those twins had been identical or fraternal, Orna explained: "We spent 20 years together, and that was a close experience. And that hasn't changed all these years we've been apart. So *I don't feel that genetics make any difference*" (I 3, emphasis added).

None of our MZ twin respondents reported any problems with the development of individual identities.⁷ Given all the differences between them and their identical twin brothers/sisters, the thought seemed absurd. When we asked identical twin sisters Jessica and June (who, to an outsider, look *very* similar) whether there had ever been any jealousy between them, June said:

I used to always wish that maybe I was a bit more like her sort of thing. I always wished I had a bit more of her personality than my personality.

⁷Interestingly, one of our DZ twins raised the issue. Tiffany, 47, told us that one of the disadvantages of twinship is "not being me as an individual, and always having to share" (I 14). For issues related to the development of separate identities in MZ twins, see Davis and Davis (2005).

And I've gone through stages when I wished I looked more like her, because we don't feel that we look anything like each other.

(I 16)

Not only our identical twin respondents but also the fraternal twin interviewees understand genes only as partly responsible for what makes a person. Gabriella, Lauretta and Yasemine all said they would not attempt to replace a deceased loved one with a person genetically identical to him or her because it would not bring back the dead: "You can't repeat what you already got" (Gabriella, I 8).

What does it mean to MZ twins, then, to be *genetically* identical? For June, genes do not play a role at all: "I don't think about that sort of stuff" (I 16). Emma said that she only started to conceive of the relationship with her twin sister in genetic terms when they started going to the Twin Research Unit: "We knew we were identical twins, we didn't think of the genetical, of that part, you know, until this year" (I 12). Alexis and Saffi, having grown up thinking that they were not identical twins (the pediatrician had drawn that conclusion from the existence of two placentas at their birth), found out that they were MZ twins when the staff at the Twin Research Unit at St. Thomas' Hospital tested them. Saffi describes the effect this had on her and her sister:

To actually be told that we were actually one egg that split rather than two separate eggs made the bond much stronger, as if we had that bond anyway. [...] Finding out [that we were identical] was the missing piece of the jigsaw. (I 4)

According to the MZ twins in our study, being identical twins is made of a different "stuff" than genes. For many of our respondents, the core characteristic of identical twins is symbolized in the image of "one egg that split" (Richard, I 17). Furthermore, the awareness of being identical twins came from, and manifested itself in, (a) having spent large parts of their lives together and (b) looking alike. It was surprising for us to find that none of our MZ respondents mentioned "identical genes" as the *reason* for looking alike. Mostly, respondents saw the "identical" treatment that they had received from their parent(s), or the fact that they had been dressed alike as children, as closely related to their status as identical twins. In one instance, being dressed alike was even seen as an *indication* for the respondents' status as an identical twin: "[We

always knew we were identical twins] because mother always dressed us alike. I suppose *that's the first indication that we were identical*" (Karen, I 7, emphasis added). Jessica mentioned as one of the most important aspects of being an identical twin the fact that she had a sister her own age (I 16).

Most of all, the twins' special bond and the feeling of being identical twins seemed to be a *relational* matter, for which the strict dichotomy of either being entirely separate, atomistic individuals on the one hand, or "being only two halves" on the other, seemed inappropriate. Many of our identical twin respondents said that their special bond was something inexplicable. In Karen's account, the awareness of being identical twins (again, without having an explicit genetic component) even overrode the authority of medical knowledge:

When we came to Thomas' [the Twin Research Unit at St. Thomas' Hospital, BP/TS] first, twelve years ago, they rang up and told us we're not identical. [...] And we just said: Rubbish!! [...] The next time we came they tested us again and they rang and said: You're right! And we thought: What does that say for the rest of everybody else's tests?" [giggles] (I 7)

All of our MZ respondents who consciously considered the meaning of being genetically identical regarded it as a blessing. For Saffi, "sharing the genes" seemed to be seamlessly incorporated in the larger experience of sharing with her twin sister: "As I saw things on the television about genes and, you know, it made me realize that I was lucky to share my genes with [Alexis]" (I 4).

While most of our MZ twin interviewees acknowledged their status as a "rarity" (Alexis, I 4), they usually did not experience it as something negative. In Saffi's words: "We think twins are very powerful without even having to do anything, just their presence, our energy. We've got like a double energy when we're together" (I 4). Amanda remembers: "We were sort of a bit unusual, you know, because we were the twins. [...] We were a set of twins in a small community, we were never addressed as Amanda and Emma. [...] But, you know, it didn't cause us problems. It wasn't a negative thing" (I 12). A little later, her twin sister Emma joins in: "My father used to boast. [...] It was sort of a unique thing. I suppose we felt like unique in that way" (I 12).

A negative aspect of the experience of twinship are the preconceptions of outsiders, which virtually

all of our MZ interviewees complained about. The fact that DZ twins also seem to be affected by the failure of some singletons to fully acknowledge the individuality of human beings who look very much alike and/or who go through large parts of their lives together, indicates that this is much rather a problem related to superficial characteristics of similarity (such as wearing similar clothes, having the same eye and hair color, etc.) than to identical genes. Let us first look at the experience of identical twins:

Jessica: "People still now always look at us as one person. They don't see us as individual people." [...]

June: "People always thought if there's (I 16) something wrong with one of us, there's also something wrong with the other. [...] They think that because we're identical, everything's exactly the same."

Karen and Monica, like many of our other twin interviewees, complained that earlier in their lives, many people did not refer to them by their names but simply called both of them "Twinnie". In Monica's account, "[i]n a way they still do, it can be quite annoying... [...] They don't look for any difference" (I 7). The most absurd example of preconceived notions from outsiders was relayed to us by Monica as well: When food was scarce during WWII and the twins worked in the same hospital in Birmingham, "[t]hey tried to give us one [ration] between us! [...] Well, they didn't get away with it, but they tried!" (I 7).

Problems with preconceptions from strangers (sometimes—but to a lesser extent—also from friends and family) who fail to see twins as individuals is also part of the twinship experience of many DZ twins. Tiffany, 47, who, with her dark curls and brown eyes, looks very different from her taller, blonde and blue-eyed twin sister, told us that people still saw her only as her sister's twin:

Tiffany: "I always felt as if the twins stopped with Karla and there were people out in the street and they were: 'Oh, there are the twins!' And there was Karla, and they'd always remember Karla, you know, and nobody would ever

remember me. And even now,
after all these years...”

Karla: “...you’re Karla’s twin!”
[laughs]

Tiffany
[sadly]: “I’m Karla’s twin...” (I 14)

An unexpected side of people’s reactions to identical twins was that many of our non-identical twin respondents (both fraternal twins, and singletons) found identical twins “scary”, “weird”, etc. Identical twin Gerald explains that

My wife, you know, [...]he felt she was in between our relationship. She used to find our relationship weird, you know, sad. And I think she educated me a little bit. [...] This was one of the forces why I left Sweden [where Gerald had moved to work with his twin brother Rick in their early 20s, BP/TS] and came back. (I 15)

Gabriella, who has a fraternal twin sister, said that she “would have hated” to be born an identical twin. She would have *hated* it?

Oh God, yeah... [...] Because I believe in your own identity, you know? You’ve got this other person who looks like you... [...] I find this a bit too sickly, you know... They’re dressed the same, they’ve the same mates... No! It doesn’t seem as if they have their own identity! [...] There’s something unnatural about identical twins [laughs]. (I 8)

Our identical twin interviewees reacted almost equally negatively to the scenario of having been born either a fraternal twin or a singleton. Saffi, for example, said that “[b]eing an identical twin, to us, is more special than being a fraternal twin” (I 4). Amanda said that if she had twins herself, she would not want fraternal twins but only identical ones (I 12). For June, having fraternal twins was even something that seemed remote as a concept:

If I had twins I’d want them to be identical. You know, *when you say twins, I automatically think ‘identical’*. I just think non-identical twins, obviously, it’s just like a normal sister or a normal brother, I think. (I 16, emphasis added)

All our interviewees, MZ and DZ twins, as well as singletons, reacted negatively when asked whether they would have preferred to be born in any of the

other groups. This resonates with existing literature on the *endowment effect*, the empirical observation that people “demand much more to give up an object than they are willing to spend to acquire it” (Huck, Kirchsteiger, & Oechssler, 2005, p. 689). This suggests that what our interviewees fear most is less linked to what is “common” or “natural”, but more to what is unknown from their own experience.

The scenario of “belated twins” and the confusion of social relationships

The argument that HRC is wrong because it would irreversibly distort the relationship between generations (as present generations could determine the genomes of future generations) was most prominently presented by Jürgen Habermas (2003) and since then discussed by many others (for an overview, see Harris (2004)). It often entails the claim that HRC should be banned, because an act as invasive as determining somebody’s genome should not be performed without the future person’s consent.

Furthermore, Hans Jonas (1974) and others argued that unlike identical twins, clones—as “belated” twins—or “‘delayed’ genetic twin[s]”, as a report by The Wellcome Trust (1998) refers to them—would be influenced by what the progenitor had done in his or her life. This would be an unjustifiable intrusion into the life of the “belated twin”. While this falls into the second category of arguments against HRC, as it refers to the absence of an “open future” for the clonee, it also implies a large impact on the relationship between the “producer” and the “produced”, including the diffusion of the concept of parenthood.

We approached the issue by asking our respondents (twins and singletons) to follow us into a number of thought experiments, all of which included the scenario of someone deliberately having created the respondents in a particular way. None of our respondents was enthusiastic about any of these scenarios. Three interviewees (two MZ, one DZ) said that they would not mind having been *deliberately* created as twins, as they enjoyed their twin status. However, none of our MZ twin respondents liked the idea of one of the two twins having been born after the other, mainly because they would be afraid of the comparison. As Jennifer put it: “I would be looking over my shoulders to see whether she’s doing the same thing

as me” (I 1; interestingly, none of our respondents referred to their own experiences with being compared with their twin sisters or brothers in this context). Alexis and Saffi surprised us with their explanation for why they felt uncomfortable with the idea of a “belated twin”:

Saffi: “If she weren’t there, I’d know that my attachment isn’t attached to something.”

Alexis: “[...] I don’t think it would be so good. I think that the person mentally wouldn’t cope—or physically. They would not feel...”

Saffi: “...complete...”

Alexis: “...Complete. They would always feel that something is missing – something wasn’t right about them. Definitely.”

Saffi: “Because you have an awareness of your twin, and a bond, and that’s created obviously when the egg splits.”

Alexis: [to her sister:] “Very good! Yeah... [...]”

Saffi: “Fraternal twins I don’t think it’d affect them. But if they were one egg, if they’re identical, definitely it would.”⁸

(I 4)

In addition, it was the intentionality with which they would have been “produced” that many of our respondents did not like. Introducing choice and motive into the field of reproduction (beyond the level of choice and motive which is already present in natural reproduction) made our respondents feel uncomfortable, as it would shift certain developments from the impersonal realm of “fate” into the realm of personal relations and responsibility. As fraternal twin Mildred put it: “What would have happened if we had not turned out as they wanted? [...] They specifically had me for a specific reason, isn’t it?” (I 5). Jennifer, too, did not like the idea that her parents might have deliberately created her and her twin sister Julia as genetically identical:

That’s a hard question, because...[silence] If I was happy being a twin and our parents had chosen us to be a twin, I’d say yes, that was nice! [... But] I’d think there was an ulterior motive to it, and I wouldn’t like that. (I 1)

⁸Note that Alexis and Saffi obviously did not think of asexual reproduction when they talked about a “belated twin”-scenario, which is illustrated by her reference the “splitting of one egg”, which applies to “natural” twinning but not to reproductive cloning through SCNT.

Insights from our interview data add an argument to Habermas’ thesis about the distortion of the relationship “between producer and the produced” (Habermas, 2001, pp. 170–1), namely, whether or not people whose genome was determined by their “producers” would hold it against them would depend on whether or not they liked the motives that had led to the action (see also Calnan, Montaner, & Horne, 2005). Rather than spontaneous outrage over the idea of being instrumentalized, our respondents expressed the fear of not being “good enough” for the people who had created them. It is likely that this fear would also impact on the parent–child relationship. However, this concern might disappear in contexts where HRC is used to help infertile parents to have a genetically related child.⁹ In such situations, parents would opt for a child who is genetically identical to another person not *because* of this characteristic, but *in spite of* it. This renders such situations very similar to scenarios of “natural” reproduction where people can have children for a variety of “selfish” reasons without raising suspicions about instrumentalization. In addition, both cloning and genetic manipulation for medical reasons (for example, in order to create a “savior sibling” who could donate bone marrow to a sick child) were condoned by all of our interviewees.

Conclusion

Our interviews were geared towards learning how identical twins (as well as fraternal twins and singletons as control groups) perceived their identities, to what extent they saw their identities as being based on genetic sameness, and what scenarios in the eyes of the respondents contradicted “nature” or “God’s plan”. We also explored how our interviewees would react to scenarios in which someone had deliberately designed them as genetically identical—a situation which comes closer to a “real” cloning scenario by SCNT.

We analyzed the interview data along three main lines of arguments against HRC, as described at the beginning of the article: First, the claim that HRC is “against nature” or represents an instance of human beings “playing God” and is therefore reprehensible; second, that HRC would violate the human

⁹For a bioethical discussion of the importance of the genetic link for the motives of potential cloners, see Levy and Lotz (2005).

dignity of the clonees, and/or compromise their individuality; third, that HRC would confound social relationships.

With regard to the first claim, our study showed that although the themes of “interfering with nature” and “playing God” did come up in some interviews, they disappeared almost entirely as soon as the cloning scenario in question was tied into the personal life-worlds of our respondents. Whereas all of our interviewees who mentioned HRC opposed it at the abstract level, their answers became much more complex and less negative as soon as the abstract terms were filled with concrete faces and names.

With regard to the second anti-HRC claim, namely that the production of a person genetically identical to another person would violate human dignity (especially in the sense that it would deprive clonees of an open future), our results confirmed earlier findings of qualitative twin research: The nature of their genetic makeup does not play an important role for twins’ experience of identical twinship (see Davis & Davis, 2004, p. 18). Less than half of our MZ twin respondents said that they ever conceived of the bond with their twin sister/brother in genetic terms; those who did so perceived it as something positive. Being identical twins, however defined (mainly through “looking alike”, “stemming from one egg”, or having gone through many stages in life in close physical and emotional connection to each other), was perceived as a blessing by all of our respondents. Twins named as the only disadvantage of twinship the preconceptions they faced from strangers, as well as sometimes from family and friends. An unexpected finding was that both identical and fraternal twins seemed to suffer to a similar extent from people’s assumptions that twins are “two halves”. Based upon the experiences of our respondents, it seems to be that in addition to physical similarity, there are other aspects of twinship which trigger the assumption in people that the individuality of twins is compromised. This insight, we believe, is highly relevant for the debate on HRC. It might be the synchronicity of life-courses—with practical and symbolic manifestations such as dressing alike, and talking in similar manners—that impacts on the degree of “individuality” that outsiders attribute to human beings. The synchronicity of life-courses, of course, is a particularity of twins, and not of “clones”. Indeed, the literature on issues in identity formation in twins regards the fact that twins go

through life in close physical and emotional connection as potentially problematic. For example, a twin must separate him- or herself not only from the mother, but also from the twin sister or brother (see Stewart, 2003, p. 66). The biographical synchronicity characteristic of twins would be absent in the case of HRC, where two genetically identical people would be born at different times. Whereas in some cases, the progenitor would also be the social parent of the clonee, this must not necessarily be so. It can be assumed that the absence of biographical synchronicity (as well as the absence of “twin symbiosis”) between the clonee and his or her progenitor would render irrelevant some of the issues in identity formation that many twins struggle with (notably independent of whether or not they are identical; see Stewart (2003, pp. 74–76)). In addition, Kerry Lynn Macintosh counters the claim that clonees raised by their progenitors would be robbed of an open future by indicating that

identical twins observe each other’s preferences, choices, talents, efforts, and outcomes in every aspect of life. It would be impossible not to react to such a wealth of information regarding one’s closest genetic relative. But everyone understands that the lives of identical twins are not second-hand or inherently constrained. (Macintosh, 2005, p. 29)

Whereas particular problems and potentials might arise in cases where the progenitor raises the clonee, it need not be assumed that identical genetic makeup would render the parent–child relationship generally more difficult than “normal” parent–child relationships. While the scenario of progenitor parents trying to force their children (created through HRC) into a mold and confront him or her with particular expectations is certainly possible, it cannot be assumed that this situation would be the norm, nor that it would be very frequent. People could resort to HRC for reasons other than choosing someone genetically identical, as exemplified by infertile couples who would want a “normal” genetically related child but cannot have one and therefore opt for cloning (Prainsack, 2006).

This relates to the question of whether or not HRC would confound social relationships. Most of our respondents (both twins and singletons) reacted negatively to imaginary situations in which someone had deliberately created them as genetically identical to another person. It turned out that the feeling of “instrumentalization” was less prevalent than the

fear of not being able to live up to expectations, and the unease about not knowing the motives of their “producers”. All our respondents questioned the reasons and objectives with which somebody would determine somebody else’s genome. Simultaneously, virtually all of our interviewees explicitly excluded medical reasons (as most prominently mentioned, cloning a “savior sibling” for bone marrow transplantation in order to save the life of an existing child) from the range of motives for HRC that they would reject.

What conclusions can we draw from this for a “real” cloning scenario? Cautiously applying the insights gained from our study, we draw a picture of what some aspects of a potential clonee’s life might look like (for practical reasons, let us assume that in our case it is a female person): Without taking the particularities of her personality and social environment into account, we can assume that she probably does not feel that her individuality is compromised due to her “sharing” the genes with her progenitor. The chances are high that she perceives the unique relationship with her progenitor as a blessing. The fact that she physically resembles her progenitor, who, let us assume, also happens to be her social mother, sometimes triggers people’s stares, but not much more than in the case of many other mothers and daughters. Our clonee does not mind, as she is aware that “clones” are a rarity. She does not experience her uniqueness as a negative thing.

The one aspect of her clone status that causes her distress are the preconceptions of people who know that she is a “clone” and assume that she is not a “real” person. People even assume that she will always suffer from the same diseases or traits at the same stages of her life as her progenitor parent, although experience from twin studies has already proven this assumption wrong.

Does our clonee, or do people in her immediate environment, think that her birth was an instance of “interfering with nature”, or “against God’s will”? This is unlikely. The one thing that would have made her uncomfortable would have been her “mother” trying to “immortalize” herself by producing a clone, out of narcissism and vanity.¹⁰ If our clonee had learned about this precondition for her existence, she might have suffered from doubts and distress, possibly comparable to the pain of children

who learn that their parents did not want them and their conception was an “accident”.

Of course we will not know how our clonee really feels unless—if ever—a “real” clonee comes into existence. Learning about the experiences of identical twins, however, can change our understanding of the potential effects of HRC on cloned individuals and thereby shift some of the emphases of the cloning debate. Although particular issues would be prominent in situations in which clonees were raised by their progenitors (which we could not simulate here), we have no reason to assume that asynchronic life-courses of genetically identical people would pose more serious challenges to their individual development than is the case with synchronic life-courses of identical twins. Genes are something that individuals relate to labs, newspapers, and on television. In the lived and embodied experience of genetically identical people, there are other factors which they perceive establish the feeling of likeness, identity, love, and estrangement.

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References

- Barral, M. R. (1965). *Merleau-Ponty: The role of the body-subject in interpersonal relations*. Pittsburgh, PA: Duquesne University Press.

¹⁰For a discussion of the potential problem of sexual attraction between clonees and the partners of their progenitor parents, see Levick (2004).

- Bartlett, A. (2005). Playing God, Frankenstein, Human Cloning, and the Imitation of God. <<http://www.cla.purdue.edu/academic/engl/conferences/covar/Program/bartlett.pdf>>.
- Battaglia, D. (1995). Fear of selfing in American cultural imaginary or “You Are Never Alone with a Clone”. *American Anthropologist*, 97(4), 672–678.
- Blackford, R. (2005). Human cloning and ‘posthuman’ society. *Monash Bioethics Review*, 24(1), 10–26.
- Bowring, F. (2003). *Science, Seeds and Cyborgs. Biotechnology and the Appropriation of Life*. London, UK: Verso.
- Bozeman, J. M. (1999). Field notes: The Raelian religion—Achieving human immortality through cloning. *Nova Religio*, 3(1), 154–159.
- Burley, J., & Harris, J. (1999). Human cloning and child welfare. *Journal of Medical Ethics*, 25(2), 108–113.
- Burlingham, D. (1949). The relation of twins to each other. *Psychoanalytic Study of the Child*, 1, 205–210.
- Calnan, M., Montaner, D., & Horne, R. (2005). How acceptable are innovative health-care technologies? A survey of public beliefs and attitudes in England and Wales. *Social Science & Medicine*, 60, 1937–1948.
- Charmaz, K. (1990). “Discovering” chronic illness: Using Grounded Theory. *Social Science & Medicine*, 30(11), 1161–1172.
- Charmaz, K. (2000). Grounded Theory: Objectivist & constructivist methods. In N. Denzin, & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed, pp. 509–535). Thousand Oaks: Sage.
- Costa, J., & Mossialos, E. (2003). Attitudes towards biotechnology applications in the UK: The role of knowledge and beliefs. LSE Health and Social Care Discussion Paper no. 10. <http://www.lse.ac.uk/collections/LSEHealthAndSocial-Care/pdf/DiscussionPaperSeries/DP10_2003.pdf>.
- Council of Europe (1998). Additional protocol to the Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine, on the prohibition of human beings. ETS no. 168, Paris, France.
- Csordas, T. J. (1994). Introduction: The body as representation and being-in-the world. In T. J. Csordas (Ed.), *Embodiment and experience. The existential ground of culture and self* (pp. 1–26). Cambridge, UK: Cambridge University Press.
- Davis, D.L., & Davis, D. (2004). Acting the part: Identity politics and the performance of *Twinship* at Twin Festivals in the USA. In Paper presented at the 11th international congress of twin studies, session on *twin family and twin relations*, 2 July, Odense, Denmark.
- Davis, D., & Davis, D. (2005). Like peas in a pod, not! A life cycle approach to embodiment and identity among identical twins. In Paper presented at the joint meetings of the Psychological Anthropology and the American Ethnology Society, 9 April, San Diego, CA.
- Davis, D.L., & Davis, D. (2006). Dualing memories: Twinship and the disembodiment of identity. In Gallinat, A., Collins, P. (Eds.), *Memory and experience as resources: Putting the “I” back into reading, doing and writing ethnography*, Forthcoming.
- Dunne, D. (1998). Cloning. <www.wordwiz72.com/cloning.html>.
- Evans, J. H. (2002). *Playing God? Human genetic engineering and the rationalization of public bioethical debate*. Chicago, IL: University of Chicago Press.
- Evers, K. (1999). The identity of clones. *Journal of Medicine and Philosophy*, 24(1), 67–76.
- Feinberg, J. (1992). The child’s right to an open future, in freedom and fulfillment. *Philosophical Essays*, 76–97.
- Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine.
- Gould, S. J. (1998). Dolly’s fashion and Louis’s passion. In M. C. Nussbaum, & C. R. Sunstein (Eds.), *Clones and clones: Facts and fantasies about human cloning* (pp. 41–53). New York: Norton & Company.
- Habermas, J. (2001). An argument against human cloning: Three replies. In J. Habermas (Ed.), *The postnational constellation: Political essays* (pp. 163–172). Cambridge: MIT Press.
- Habermas, J. (2003). *The future of human nature*. Cambridge, UK: Polity Press.
- Harris, J. (2004). *On cloning*. New York: Routledge.
- Hartmann, H. (1964). *Essays on ego psychology: Selected problems in psychoanalytic theory*. London, UK: The Hogarth Press.
- Hopkins, P. D. (1998). Bad copies: How popular media represent cloning as an ethical problem. *Hastings Center Report*, 28(2), 6–13.
- Huck, S., Kirchsteiger, G., & Oechsler, J. (2005). Learning to like what you have—Explaining the endowment effect. *Economic Journal*, 115, 689–702.
- Jonas, H. (1974). *Philosophical essays: From ancient creed to technological man*. Englewood Cliffs, NJ: Prentice-Hall.
- Kuhse, H. (2001). Should cloning be banned for the sake of the child? *Poiesis & Praxis: International Journal of Technology Assessment and Ethics of Science*, 1(1), 17–33.
- Levick, S. E. (2004). *Clone being. Exploring the psychological and social dimensions*. Lanham: Rowman & Littlefield Publishers.
- Levy, N., & Lotz, M. (2005). Reproductive cloning and a (kind of) genetic fallacy. *Bioethics*, 19(3), 232–250.
- Macintosh, K. L. (2005). *Illegal beings: Human cloning and the law*. Cambridge, UK: Cambridge University Press.
- McCarthy, D. (1999). Persons and their copies. *Journal of Medical Ethics*, 25(2), 98–104.
- Meilaender, G. (2000). Human cloning would violate the dignity of children. In G. McGee (Ed.), *The human cloning debate* (pp. 268–275). Berkeley, CA: Berkeley Hills Books.
- Merleau-Ponty, M. (1962). *Phenomenology of perception*. London: Routledge & Kegan Paul.
- Napolitano, C. L., & Ogunseit, O. A. (1999). Gender differences in the perception of genetic engineering applied to human reproduction. *Social Indicators Research*, 46(2), 191–204.
- Nerlich, B., & Clarke, D. D. (2003). Anatomy of a media event: how arguments clashed in the 2001 human cloning debate. *New Genetics and Society*, 22(1), 43–59.
- O’Neill, O. (2002). *Autonomy and trust in bioethics*. Cambridge: Cambridge University Press.
- Prainsack, B. (2006). “Negotiating life”: The regulation of embryonic stem cell research and human cloning in Israel. *Social Studies of Science*, 36(2), 173–205.
- President’s Council on Bioethics (PCB) (2002). *Human cloning and human dignity: An ethical inquiry*. Washington DC. <http://www.bioethics.gov/reports/cloningreport/pcbe_cloning_report.pdf>.

- Revel, M. (1998). An outright, upfront condemnation of cloning research is premature. *Scientist*, 12(2), 8.
- Schapera, I. (1927). Customs relating to twins in South Africa. *Journal of the African Society*, 26, 117–137.
- Segal, N. L. (2000). *Entwined lives: Twins and what they tell us about human behavior*. New York: Plume.
- Silver, L. M. (1998). Cloning, ethics, and religion. *Cambridge Quarterly of Healthcare Ethics*, 7, 168–172.
- Stewart, E. A. (2003). *Exploring twins: Towards a social analysis of twinship*. New York: Palgrave, Macmillan.
- Strong, C. (2005). The ethics of human reproductive cloning. *Ethics, Law and Moral Philosophy of Reproductive Biomedicine*, 1(1), 45–49.
- Turner, V. (1969). *The ritual process: Structure and anti-structure*. London: Routledge & Kegan Paul.
- United Nations' General Assembly (UN-GA) (2005). *Resolution Adopted by the General Assembly 59/280: United Nations' Declaration on Human Cloning*. March 23. <<http://daccessdds.un.org/doc/UNDOC/GEN/N04/493/06/PDF/N0449306.pdf?OpenElement>>.
- Weiss, R. (1995). *Learning from strangers. The art and method of qualitative interview studies*. New York: Free Press.
- (The) Wellcome Trust (1998). *Medicine in society programme, public perspectives on human cloning*. London. <<http://www.wellcome.ac.uk/assets/wtd003421.pdf>>.
- Wilmut, I. (2001). Finding the right questions to ask about the lives of human clones. *Nature*, 412, 583.
- Winestine, M. C. (1969). Twinship and psychological differentiation. *Journal of the American Academy of Child Psychiatry*, 8, 436–455.