The Columbia

SCIENCE AND TECHNOLOGY LAW REVIEW

www.stlr.org

AM I MY SON? HUMAN CLONES AND THE MODERN FAMILY

W. Nicholson Price II[1]

As increasingly complex assisted reproductive technologies (ART) become available, legal and social conceptions of family become ambiguous and sometimes misaligned. The as-yet unrealized technology of cloning provides the clearest example of this confusion: is the legal parent of a clone the individual cloned, or are that individual's parents also the parents of the clone? These issues have been generally obscured by the debates around the deployment of ART, especially cloning; far less consideration has been given to the way these new technologies impact the way we think about and develop law on the relationships between genetic, social, gestational, and legal parenthood. This article considers these issues in depth, looking at competing common-law frameworks for determining parentage, the statutory framework of parentage, and deeper theoretical concerns underlying the area. The article concludes that an intent-based framework, with at least some external limitations, most accurately matches law to social views of parents using new forms of ART.

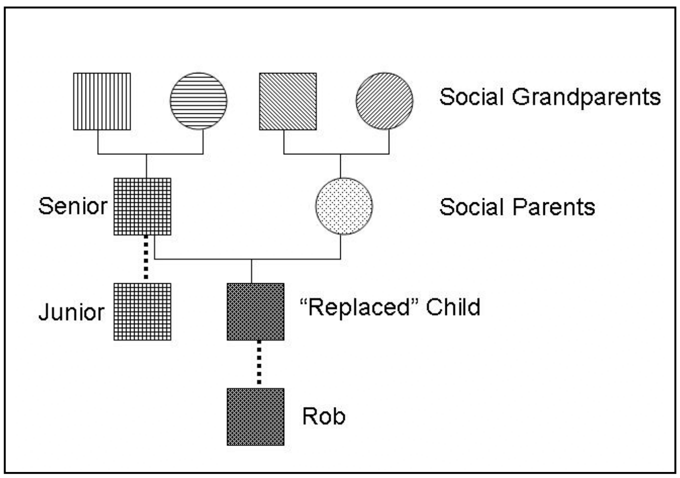
---

[1] JD/PhD Candidate (Biology), Columbia University 2011. The author wishes to thank Ana Bračič for advice and support, and Profs. Katherine Franke, Ariela Dubler, and Patricia Williams for helpful comments.

Available at http://www.stlr.org/cite.cgi?volume=11&article=5

INTRODUCTION

Two sympathetic stories are frequently told in debates about human reproductive cloning.[2] In the first, a young child dies in a tragic accident, but some of the child's cells remain viable, and the parents want to clone their beloved child.[3] In the second, a doubly infertile couple—a woman unable to produce viable ova and a man unable to produce viable sperm—wish desperately for a child genetically related to at least one of them, and therefore clone one member of the couple.[4] These stories normally serve to illustrate the poignant situations which might justify human reproductive cloning, but they illustrate another point equally well: in the context of human cloning, our intuitions can vary widely about how we see the cloned child fitting into the world around it. In the first situation, we intuit clearly that the parents of the prematurely deceased child should also be considered the parents of the clone—call him Rob (for "Replacing Our Boy"). In the second situation, we intuit just as clearly that the clone—call him Junior—should be considered the child of the infertile couple, one of whom provided the genetic material



Family Tree of Paradigm Clones: ***Following traditional formatting, males are shown as squares and females as circles; solid lines show descent by sexual reproduction. Individuals are patterned according to their genetics. Cloning is indicated by a thick dotted line. The social parents and grandparents are the same for Rob and Junior, but the genetic relationships (defined as the origin of sets of chromosomes) between those individuals are different.***

---

[2] A note on terminology: the term "clone" can refer to entities at many states in the development process. For the purposes of this paper, "human clone" will refer only to post-birth children cloned from an adult somatic cell via somatic cell nuclear transfer (SCNT). Further details on the cloning process will follow, but it should be clear from the start that "clones," here, refer to human beings after birth, and not to early or late stage embryos or fetuses; it also refers only to SCNT clones, not embryo-splitting clones or natural clones—*i.e.,* identical twins.

[3] M Fainzilber, *Advantage of Knowing Nature's Secrets*, 386 Nature 431 (1997).

[4] CBS News, *Cloning For Infertile Couples?, Cloning A Way For Infertile Couples To Have Their Own Family* , http://www.cbsnews.com/stories/1998/07/22/tech/main14458.shtml (July 22, 1998).

for the cloning.[5]

Socially, these attributions make intuitive sense. Biologically, they are incompatible definitions, because the child has a different genetic relationship to the socially intuitive parents in each case.[6] The family tree shown below demonstrates this point. Rob effectively gets his two sets of chromosomes from the parents of the child being replaced, albeit through a physical intermediary. Junior, on the other hand, gets all of his DNA from one member of the infertile couple (Senior). Since he has the same genetic makeup as Senior, he also gets the two halves of his genetic information from Senior's parents—that is, the people we would intuitively consider Junior's grandparents. Therefore, his social grandparents fill the typical genetic role of parents. Even though the social family tree is the same for Rob and Junior, with social grandparents, parents, and a clone child, Rob and Junior occupy different places in the genetic family tree. It is this dichotomy that makes clones particularly well suited to tease apart the interactions between social and biological parentage.

Legally, the meaning of "parent" is a muddled mixture of biological and social factors.[7] Recent developments in assisted reproductive technology have begun to challenge social and legal notions of parentage. The unique circumstances of human clones shed further light on these challenges in two ways. First, and most straightforwardly, the poor fit of clones into current explicit family law definitions reveal the relative rigidity of even modern and supposedly comprehensive frameworks. Second, and perhaps more fundamentally, the boundary case of clones can help illuminate more central concepts of family. Specifically, clones demonstrate the insufficiency of disaggregating parentage into social and biological aspects, or even further disaggregating biological parentage into gestational and genetic, since "genetic parent" is itself an ambiguous idea. Science-based atomization of parental concepts is unlikely to yield definitive rules for courts and society, especially when the science involved is constantly changing. When faced with hard social questions in areas of changing science, the law should look to that science for input, not answers.

---

[5] I am aware of the unfortunate circumstance that a felicitous acronym and the Anglo-American limitation of name-sharing to males combine to make both example cases unrepresentatively male. I apologize for this, but hope that increased ease of reading outweighs the unintentional demographic slight.

[6] In this introductory analysis, I use genetic parents to mean those two individuals who contribute exactly half of the genetic information to the genetic child. Therefore, the donor is not a genetic parent because he contributes all of his genetic information. Other potentially reasonable definitions of genetic parents exist and are considered in detail in section III.C.1.

[7] For other analyses of the modern interactions between social and biological factors in family contexts, see generally Janet L. Dolgin, *Biological Evaluations: Blood, Genes, and Family*, 41 Akron Law Review 347 (2008); Melanie B. Jacobs, *Micah Has One Mommy and One Legal Stranger: Adjudicating Maternity for Nonbiological Lesbian Coparents*, 50 Buffalo Law Review 341 (2002); M. B. Jacobs, *My Two Dads: Disaggregating Biological and Social Paternity*, 38 Arizona State Law Journal 809 (2006); MB Jacobs, *Why Just Two? Disaggregating Traditional Parental Rights and Responsibilities to Recognize Multiple Parents*, 9 Journal of Law and Family Studies 309, 309-339(2007).

Surrounding any discussion of human cloning and the law is a vigorous debate on the morality of allowing any human reproductive cloning at all. [8] Commentators have written on the reproductive choice benefits of allowing human cloning,[9] the benefits to society of replicating the genomes of great individuals,[10] and the necessity of ensuring fair treatment of practically close-to-inevitable clones.[11] Likewise, much has been written about the practical and potentially unacceptable medical difficulties of human cloning,[12] the challenges to personhood of having the genome associated with an already-lived life,[13] and concerns about objectifying children.[14] This paper will not venture into the realm of morality, which has been and is being well canvassed by others. Rather, it will focus exclusively on the practical and theoretical ways that clones interact with and change our understanding of the bases of the parent-child relationship.

This Article proceeds in five Parts. Part I addresses the background rhetoric around this issue, considering the foundational physical and informational ideas that underlie these conceptions of family relationships and how the features of human clones can disaggregate and complicate them. In Part II, I discuss practical details which shape both the theoretical and real-world implications of human clones: the specifics of cloning science, the status of human cloning, and existing laws and guidelines about cloning. Part III examines the interactions of human clones with the common law of determining complex parentage, particularly the pure-genetics rule and the procreative-intent test. Part IV steps back to look more generally at the comprehensive statutory framework for parentage law, the Uniform Parentage Act, and the way human clones illuminate problems in its view of parentage. Part V examines further implications of the current situation and recommendations for improving it.

---

[8] *See, e.g.*, Leon R. Kass, Human Cloning and Human Dignity: The Report of the President's Council On Bioethics (2002); Leon R. Kass & James Q. Wilson, The Ethics of Human Cloning (1998); L. R. Kass, *The Wisdom of Repugnance: Why We Should Ban the Cloning of Humans*, 32 Val. U.L. Rev. 679, PINCITE (1997); Ronald Cole-Turner, Human Cloning: Religious Responses (1997); William Dudley, The Ethics of Human Cloning; Glenn McGee, The Human Cloning Debate (2002); Gregory E. Pence, Flesh of My Flesh: The Ethics of Cloning Humans: a Reader (1998); M. C. Brannigan, Ethical Issues in Human Cloning (2001).

[9] John Harris, *"Goodbye Dolly?" The Ethics of Human Cloning, 23* J Med Ethics 353 (1997).

[10] Joshua Lederberg, *Experimental Genetics and Human Evolution*, 100 Am. Naturalist 519, 519-31 (1966).

[11] Kass, *supra* note 8.

[12] Kass, *supra* note 8, at 99-101; S. M. Rhind et al., *Human Cloning: Can It Be Made Safe?*, 4 Nature Reviews Genetics 855, 855-864 (2003).

[13] Dan W. Brock, *Human Cloning and Our Sense of Self*, 296 Sci. 314, 314-16 (2002); Kass, *supra* note 8, at 114-116.

[14] Kass, *supra* note 8, at 116-120.

I. Background Rhetoric: "Blood Relatives" and "Flesh and Blood" Relationships.

The language of human relationships, both conversational and legal, reflects the overlap and aggregations between social and biological concepts. Among the oldest descriptions of biological relationships are the ideas of "blood relatives" and "flesh and blood" relationships.[15] Both terms are rooted in the biology of engendering children, and both are still used by courts to describe biological bases for family relationships. Recently, though, their meanings have begun to diverge, reflecting the technological and scientific disaggregation of social, gestational, and genetic parenthood. These differing meanings, challenging to parse independently, become much more clearly separable in the context of human clones.

Blood relatives are conceived as individuals sharing some measure of blood, as opposed to relatives-in-law, who do not share blood from a common ancestor. Black's Law Dictionary states that "[a] person may be said to be 'of the blood' of another who has any, however small a portion, of the blood derived from a common ancestor."[16] "Historically and at common law, blood relation was the primary means of establishing the legal status of a natural parent."[17]

The idea of shared blood in blood relations has been largely subsumed by the modern notion of genetics: "[u]nder today's laws of parentage, a genetic relationship and blood relationship of the correct degree describe and result in the same legal status or relationship, and proof of either is still the primary means of establishing parentage."[18] Support for the contention that genetic relationship is the modern equivalent of the term "blood relationship" can be found in the evidentiary practice in disputed parentage cases of comparing common biological characteristics. The practice involves the trier of fact's comparing genetic traits of the child and the alleged parent, such as facial features, build, and color of hair and eyes, to confirm or rebut a blood relationship."[19] In a sense, "blood relatives" have become about information, not physicality—they rely on the continuity of genetic information and traits. DNA tests for paternity or maternity are similarly based on having the same informational content, and the same alleles of genes.[20] The earlier

---

[15] "Flesh," "blood," and "flesh and blood" are terms with a rich literature of scholarship in many fields outside of law, and even in subfields of law. Those discourses, however, are outside the scope of this work. For at least one modern view on this topic, see Roy Porter & Simon Schama, Flesh in the Age of Reason 573 (2004).

[16] Black's Law Dictionary 218 (4th ed. 1968) (citing *Miller v. Grimes*, 262 Pa. 226, 226 (1918)).

[17] *Belsito v. Clark*, 644 N.E.2d 760, 763 (Ohio Ct. Pleas 1994), *citing* 1 Blackstone, Commentaries on the Laws of England (7 Ed. 1775), Chapter XVI, Of Parent and Child.

[18] *Id.* at 763.

[19] Id. at 763, citing Domigan v. Gillette, 479 N.E..2d 291 (Ohio Ct. App. 1984).

[20] UPA §§ 102(15), 505; *see also* Sergio D. J. Pena & Ranajilt Chakraborty, *Paternity Testing in the DNA Era*, 10 Trends Genet.204, 204-09 (1994).

notion of physical descent—here, specifically of physically descended DNA molecules—has been sharply diminished.

The concept of "flesh and blood," however, still is grounded in the notion of the physical. The most immediate evidence of this comes in the term itself—if blood can be about or symbolic of information, flesh is almost universally used to represent physical reality. Its perhaps most obvious genesis is in fact in the Book of Genesis: "[t]his is now bone of my bones, and *flesh of my flesh*: she shall be called Woman, because she was taken out of Man."[21] The use of "flesh and blood" to mean physical people or relationships has been incorporated into the language of law. In non-family contexts, courts refer to "flesh and blood" individuals as opposed to legal or corporate entities,[22] as the requisite victims of injury,[23] or as living objects of the law;[24] "flesh and blood" literally relies on the corporeality of an individual. In family contexts, "flesh and blood"

---

[21] Genesis 2:23 (King James Version) (emphasis added).

[22] *See, e.g., Price Waterhouse LLP v. First Am. Corp.*, 182 F.R.D. 56, 62 (S.D.N.Y. 1998)(stating that Fed. R. Civ. P. 45 was designed to prevent inconvenience to "flesh-and-blood human beings who are asked to testify, not the legal entity for whom those human beings work."); *Adams v. City of Boston*, No. 07-10698, 2008 WL 4186275, at *2 (D. Mass. Sept. 9, 2008) ("[A]n abstract entity like a municipality may present a much less compelling face to a jury than a flesh and blood defendant."); *In re Parker*, 395 B.R. 12 (Bankr. W.D. Mich. 2008) ("[A]t least one of the post-petition co-tenants will not even be flesh and blood, but rather an incorporeal fiction of the law."); *City of Auburn v. Hedlund*, 155 P.3d 149, 152 (Wash. App. Div. 1 2007) ("The statute plainly recognizes that DUI and reckless driving may potentially involve flesh and blood victims beyond the State in the abstract and the public at large."). A judicially rejected version of this distinction has cropped up in criminal defense cases, with defendants arguing unsuccessfully that

> John Joseph Smith, is a natural, flesh and blood, person, created by God. JOHN JOSEPH SMITH, is a U.S. corporate artificial person, U.S. citizen, created by the government. In basic English grammar, a name spelled in upper and lower case, such as John Joseph Smith, is indicative of a flesh and blood man, a natural person . . . . On the other hand, a name spelled in all caps, such as JOHN JOSEPH SMITH, is indicative of an artificial person.

See United States v. Mitchell, 405 F.Supp.2d 602, 603-04 n.4 (D. Md. 2005) (*quoting* http://www.usa-the-republic.com/ revenue/true_ history/AffTruth.html (visited December 16, 2005)) (date visited in original opinion).

[23] *Richardson v. Liberty Mut. Fire Ins. Co.*, 716 N.E.2d 117, 121 (Mass. App. Ct. 1999) ("Bodily injury [in the context of an insurance claim] imports harm arising from corporeal contact. In this connection 'bodily' refers to an organism of flesh and blood. It is not satisfied by anything short of physical, and is confined to that kind of injury . . . .") (*quoting Williams v. Nelson,* 117 N.E. 189, 194 (Mass. 1917)).

[24] *See, e.g., United States v. Copeland*, 369 F.Supp.2d 275, 344 (E.D.N.Y. 2005) (stating that immigration laws directly impact "human beings, flesh and blood, men, women and children").

arises most frequently in adoption law, where it functions as a label for physically engendered descendants—that is, children physically born of a woman from the physical union of a man's sperm and the woman's egg.[25] While "blood" may have become about information, "flesh" has remained about biological-physical connections.[26]

This relatively subtle and theoretical difference becomes strikingly unsubtle and real in the context of human clones, where the different conceptions of descent yield different assignments of parentage. In Rob's case, the parents of the original child are his genetic or "blood" parents as well—each provided half of the clone's genetic material, just as parents do in a traditional conception. They are not, however, the direct providers of biological physical substance which "flesh and blood" envisages—that role is filled instead by the donor of the egg and the deceased child, who provided the physical genetic material, from which the clone is made, and potentially by the gestational mother. For Junior, on the other hand, the cloned member of the couple, as the genetic donor, will actually be a "flesh and blood" parent—just not a "blood parent," or genetic parent, since the "blood parents" are Junior's "flesh and blood" paternal grandparents. By embodying this sort of contradiction, clones help to tease apart and clarify the diverging meanings of old, basic terms about family relationships.

Similarly, a close look at clones can help us see more clearly the subtleties and challenges of the modern language we use to describe families. Clones are exemplars showing that even the recent disaggregation of biological parentage into genetic and gestational shows insufficient nuance. For clones to play this illustrative role, however, we require a more detailed understanding of cloning itself.

II. The Science, Current status, and Law of Human Cloning

A careful look at the facts of cloning serves three main purposes. First, the history of cloning efforts in animals and humans shows how the technology has developed despite substantial scientific and social challenges. Second, some understanding of the details of cloning itself is necessary to correct common misconceptions about the differences between clones and donors. These differences have implications for the way clones are treated in a family context, and the way their genetic relationships illuminate the problems inherent in biologically-based family definitions. Third and finally, the history, science, and regulation of cloning, when taken together, lead to the conclusion that human cloning is quite likely in the foreseeable future, and that these issues therefore have practical as well as theoretical importance.

---

[25] *See, e.g., State ex rel. Russell v. West*, 115 S.W.3d 886, 892 (Tenn. Ct. App. 2003) (Goddard, HM, concurring) (stating reluctance because after genetic testing ruled out ex-husband as father of child, current husband was willing to let ex-husband support his "own flesh and blood").

[26] *Contra* Dolgin, *supra* note 7, at 356 (describing the substitution of genetic information for both "blood" and "flesh and blood").

A. The Basic Science of Cloning and Its Use in Animals

Cloning, also known formally as Somatic Cell Nuclear Transfer (SCNT) happens when the nucleus is removed from an unfertilized egg, and replaced with the nucleus from a somatic cell—that is, any cell other than a sperm or egg.[27] The fusion of these two is a zygote that contains all 23 pairs of chromosomes—all the genetic material necessary for a biologically normal individual.[28] The zygote can then be induced to divide with the addition of an electrical current or an ionic solution.[29] This results in an embryo that carries the same nuclear genetic complement—the 23 chromosome pairs that reside in the nucleus of the cell—as the individual from whom the somatic cell was taken.[30]

The scientific path of cloning has led through forests of skeptics. Initially, any sort of cloning was considered unachievable. Even after early successes in cloning amphibians,[31] many scientists feared that mammalian cloning—the next significant step—would involve enormous technological hurdles, or might even prove impossible.[32] These fears, however, proved to be largely unfounded. After significant but ultimately unsuccessful work on cloning in mice by different groups of scientists,[33] in 1996 a team led by Ian Wilmut at the Roslyn Institute in Scotland announced the birth of Dolly, the first mammal cloned from the adult cells of another mammal.[34] Dolly was cloned from a mammary cell of an adult ewe; the nucleus from that cell was injected into the egg of a different ewe, and the resulting embryo implanted in yet a third ewe; after a successful pregnancy, Dolly was born and had both the physical characteristics and the genetic markers of the genetic donor, not the egg donor or gestational mother.[35] This result met

[27] I. Wilmut et al., *Somatic Cell Nuclear Transfer*, 419 Nature 583, 583-86 (2002).

[28] *Id.*

[29] *Id*.

[30] *Id*.

[31] John B. Gurdon, *The Developmental Capacity of Nuclei Taken from Intestinal Epithelium Cells of Feeding Tadpoles*, 10 J. Embryology & Experimental Morphology 622, 622-40 (1962).

[32] Ian Wilmut & Roger Highfield, After Dolly: The Uses and Misuses of Human Cloning 79-80 (2006).

[33] *Id.* at 79-80.

[34] Ian Wilmut et al., *ViableOoffspring Derived from Fetal and Adult Mammalian Cells*, 385 Nature 810, 810-13 (1997).

[35] *Id.*

with tremendous worldwide media attention, including debates and outcry about the possibility of human cloning.[36]

Since the cloning of Dolly in 1996, scientists have cloned members of several other species, including gaur,[37] cat,[38] cow,[39] mule,[40] horse,[41] dog,[42] and monkey.[43] Cloning is of particular value for agriculture and biotech companies, which can use cloning techniques to more reliably make genetically modified organisms. These cloned animals can be used for traditional agricultural purposes, effectively serving as a much more advanced form of selective breeding;[44] the FDA recently declared the meat from cloned animals safe to eat, though it asked producers to voluntarily refrain from introducing cloned animal products into the food chain.[45] For biotech companies, cloned animals can be used in so-called "biopharming," where transgenic organisms produce

[36] For summaries of the media reaction, *see* Karen Kreeger, *Observers Give Mixed Reviews To Media's 'Dollymania'*, 11 The Scientist 1, 1 (1997); Tom Wilkie & Elizabeth Graham, *Power without Responsibility: Media Portrayals of Dolly and Science*, 7 Cambridge Quarterly of Healthcare Ethics 150-9 (1998).

[37] Robert P. Lanza et al., *Cloning of an Endangered Species (Bos gaurus) Using Interspecies Nuclear Transfer*, 2 Cloning 79, 79-90 (2000).

[38] Taeyoung Shin et al., *Cell Biology: a Cat Cloned by Nuclear Transplantation*, 415 Nature 859 (2002).

[39] Arief Boediono et al., *Offspring Born from Chimeras Reconstructed from Parthenogenetic and In Vitro Fertilized Bovine Embryos*, 53 Molecular Reprod. and 159, 159-70 (1999).

[40] Gordon L. Woods et al., *a Mule Cloned from Fetal Cells by Nuclear Transfer*, 301 Science 1063 (2003).

[41] Cesare Galli et al., *Pregnancy: a Cloned Horse Born to its Dam Twin*, 424 Nature 635 (2003).

[42] Byeong Chun Lee et al., *Dogs Cloned from Adult Somatic Cells*, 436 Nature 641 (2005).

[43] James A. Byrne et al., *Producing Primate Embryonic Stem Cells by Somatic Cell Nuclear Transfer*, 450 Nature 497, 497-502 (2007).

[44] Raymond L. Page & Sakthikumar Ambady, *Animal Cloning Applications in Agriculture*, 23 Engineering in Med. & Biology Magazine 27, 27-31 (2004).

[45] Press Release, U.S. Food and Drug Administration, FDA Issues Draft Documents on the Safety of Animal Clones (Dec. 28, 2006), http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/2006/ucm108819.htm; European Parliament, European Parliament Resolution of 3 Sept. 2008 on the Cloning of Animals for Food Supply P6_TA (2008)0400 (2008), http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0400+0+DOC+XML+V0//EN.

pharmaceutically useful products.[46] Partly due to these earlier commercial developments, and their associated monetary incentives, mammalian cloning is now routine enough that companies have offered to commercially clone animals, usually beloved pets, on an individual basis.[47] The market for this service is still young,[48] but as commercial cloning becomes more prevalent, the techniques involved will likely rapidly improve.

B. Technical Challenges and Advances in Human Cloning.

Human reproductive cloning is yet another significant step past general mammalian cloning, with its own technical hurdles and its own corps of skeptics. At the most basic level, for instance, the acquisition of suitable oocytes[49] is and will probably continue to be one of the most significant challenges to the development of human reproductive cloning.[50] Oocytes of any sort are expensive to acquire in countries where payment is allowed,[51] and accordingly rare in countries where payment is illegal.[52]

---

[46] Götz Laible & David N. Wells, *Transgenic Cattle Applications: the Transition from Promise to Proof*, 22 Biotech. & Genetic Engineering Reviews 125, 125-50 (2006); Brigid Brophy et al., *Cloned Transgenic Cattle Produce Milk with Higher Levels of Beta-Casein and Kappa-Casein*, 21 Nature Biotech. 157, 157-62 (2003); Alan Dove, *Milking the Genome for Profit*, 18 Nature Biotech. 1045, 1045-48 (2000); *Go-ahead for 'Pharmed' Goat Drug*, BBC, June 2, 2006, http://news.bbc.co.uk/2/hi/science/nature/5041298.stm; Elizabeth Pennisi, *After Dolly, a Pharming Frenzy*, 279 Science 646, 646-8 (1998).

[47] Jon Herskovitz, *South Korea's New High Tech Product: Cloned Dogs*, July 17, 2008, http://www.reuters.com/article/technologyNews/idUSELK72270120080717; First order for pet dog cloning, BBC, February 15, 2008, http://news.bbc.co.uk/2/hi/science/nature/7246380.stm; RNL Bio - Stem Cell Bank, https://rnl.co.kr/eng/main.asp (last visited December 16, 2008).

[48] *Dead Cats to Remain a Memory*, Wired News, October 10, 2008, http://www.wired.com/science/discoveries/news/2006/10/71938 .

[49] An oocyte is an immature egg cell.

[50] Miodrag Stojkovic et al., *Derivation of a Human Blastocyst after Heterologous Nuclear Transfer to Donated Oocytes*, 11 Reprod. BioMedicine Online 226, 226-31 (2005); Vanessa J. Hall et al., *Developmental Competence of Human In Vitro Aged Oocytes as Host Cells for Nuclear Transfer*, 22 Human Reprod. 52 (2007); Marie-Cecile Lavoir et al., *Poor Development of Human Nuclear Transfer Embryos using Failed Fertilized Oocytes*, 11 Reprod. BioMedicine Online 740, 740-44 (2005).

[51] Bonnie Steinbock, *Payment for Egg Donation and Surrogacy*, 71 Mt. Sinai J. Med. 255, 255-65 (2004); Debora Spar, *The Egg Trade—Making Sense of the Market for Human Oocytes*, 356 New. Eng. J. Med. 1289, 1289-91 (2007); Gretchen Vogel, *Stem Cells: Ethical Oocytes: Available for a Price*, 313 Science 155 (2006).

[52] Erika Check, *Ethicists and Biologists Ponder the Price of Eggs*, 442 Nature 606, 606-07 (2006); Boon Chin Heng, *Regulatory Safeguards Needed for the Travelling Foreign Egg Donor*, 22 Human Reprod. 2350, 2350-52 (2007).

Compounding the problem, successful human SCNT requires the use of high-quality oocytes—that is, mature oocytes from healthy young women.[53] This greatly reduces the already small pool of potential oocytes available for research.[54] Finally, the use of human oocytes is highly regulated, making the acquisition of available oocytes slower and more burdensome.[55]

Also problematic for mammalian cloning in general, and human cloning in particular, is the low success rate of cloning experiments to date. In animal cloning, success rates for viable offspring are about 1-2%, and of these, about 30% are born with some debilitating condition, such as "large-offspring syndrome."[56] The reasons for this low success rate are still not fully understood, though they may involve errors in "reprogramming" DNA.[57] While a low success rate is not an absolute bar to human reproductive cloning—for those seeking to jump the scientific hurdle, one success is certainly enough—it is a technical challenge that is likely to at least delay the creation of larger numbers of human clones, and to keep human cloning morally disapproved.[58]

Not so long ago, clones were confined to the realm of science fiction[59] and dystopian cinema;[60] now, although there have been no verified instances of cloned human children being born, cloned human embryos have already been created for research

---

[53] *See* R. P. Cervera & M. Stojkovic, *Commentary: Somatic Cell Nuclear Transfer--Progress and Promise*, 26 Stem Cells 494 (2008); Stojkovic et al., *supra* note 50; Hall et al., *supra* note 50; Lavoir et al., *supra* note 50; B. Heindryckx et al., *Embryo Development after Successful Somatic Cell Nuclear Transfer to In Vitro Matured Human Germinal Vesicle Oocytes*, *in* Human Reproduction (2007); Andrew J. French et al., *Development of Human Cloned Blastocysts following Somatic Cell Nuclear Transfer (SCNT) with Adult Fibroblasts*, 26 Stem Cells 485, 485-93 (2008).

[54] Vogel, *supra* note 51.

[55] Ingrid Schneider, Oocyte Donation for Reproduction and Research Cloning--the Perils of Commodification and the Need for European and International Regulation, 25 Law & Human Genome Rev. 205, 205-41(2006).

[56] Cloning Fact Sheet, Human Genome Project Information, http://www.ornl.gov/sci/techresources/Human_Genome/elsi/cloning.shtml (last visited July 9, 2010)http://www.ornl.gov/sci/techresources/Human_Genome/elsi/cloning.shtml. Large offspring syndrome results in abnormally large offspring, often with significant organ defects. *See* Lorraine E. Young, Kevin D. Sinclair & I. Wilmut, *Large Offspring Syndrome in Cattle and Sheep*, 3 Revs. Reprod. 155, 155-63 (1998).

[57] Teruhiko Wakayama, *Production of Cloned Mice and ES Cells from Adult Somatic Cells by Nuclear Transfer: How to Improve Cloning Efficiency?*, 53 J. Reprod. & Dev. 13, 13-26 (2007).

[58] S. M. Rhind, et al, Human Cloning: Can It Be Made Safe?, 4 Nat. Rev. Genet. 855 (2003)*available at* http://www.ncbi.nlm.nih.gov/pubmed/14634633.

[59] *See, e.g.,* Richard Cowper, Clone (1972); Arthur C. Clark, Imperial Earth (1976); Ben Bova, The Multiple Man (1987); A. E. van Vogt, The World of Null-A (2002).

[60] *See, e.g.,* Franklin J. Schaffner, The Boys From Brazil (1999).

purposes. In 2004 and 2005, a Korean research group led by Woo Suk Hwang claimed to have created cloned human blastocysts[61] (an early stage embryo)—a claim later found to be completely fraudulent.[62] Shortly afterwards, however, a UK group credibly created three cloned embryos from discarded IVF embryos—but they were unsuitable for research, and could not produce the cell lines they were designed to produce.[63] Finally, in January 2008, a California company called Stemagen announced that it had efficiently produced human blastocysts cloned from adult somatic cells.[64] All of the cloned embryos involved in these efforts were created with tremendous and concerted effort by teams of scientists, and all were created exclusively for research purposes, so that the cloned embryos were not allowed to develop past the blastocyst stage. Other efforts, however, have already aimed to take the embryos much farther.

In addition to the rigorously validated scientific studies creating cloned human embryos for research purposes, other groups have explicitly set their sights—or, at least, have announced their intentions—to reproductively clone humans. On December 28, 2002, the Raelians, a religious sect based in Canada, announced that they had cloned a child named Eve from a human woman.[65] They have since claimed that to have cloned 13 more children, living in secret at undisclosed locations.[66] No independent scientists have verified these claims, which are now widely dismissed as a hoax.[67] Nonetheless, the Raelians, and their associated company, Clonaid, maintain a website dedicated to human cloning, and claim to offer cloning services for infertile couples, homosexual couples, HIV-infected individuals, family members wishing to replace children, or people who wish to clone themselves.[68] Notably, the Clonaid website does not list its country of incorporation, only that it is no longer based in the Bahamas or the U.S.[69]

---

[61] Woo Suk Hwang et al., *Patient-Specific Embryonic Stem Cells Derived from Human SCNT Blastocysts*, 308 Science 1777, 1777-83 (2005); Woo Suk Hwang et al., *Evidence of a Pluripotent Human Embryonic Stem Cell Line Derived from a Cloned Blastocyst*, 303 Sci. 1669, 1669-74 (2004).

[62] Donald Kennedy, *Editorial Retraction*, 311 Science 335, 335 (2006).

[63] Stojkovic et al., *supra* note 50.

[64] French et al., *supra* note 53.

[65] Dana Canedy and Kenneth Chang, *Group Says Human Clone Was Born to an American*, N.Y. Times, December 28, 2002.

[66] Clonaid, News, http://clonaid.com/news.php?3.2.1 (last accessed December 13, 2008).

[67] 'Clone' Baby Inquiry Suspended, BBC, January 6, 2003, http://news.bbc.co.uk/2/hi/health/2631395.stm.

[68] Clonaid, Clonaid: Pioneers in Human Cloning, http://clonaid.com (last accessed December 8, 2008).

[69] Clonaid, History, http://clonaid.com/page.php?7 (last accessed December 8, 2008).

Aside from the unverified claims of the Raelians/Clonaid, other researchers have claimed significant progress in creating validated human reproductive clones. In March 2001, three doctors from the International Cloning Consortium announced that they were ready to begin human cloning to allow infertile couples to have genetically related children.[70] The consortium claimed a woman was eight weeks pregnant with a cloned human embryo in April 2002.[71] But, during a later announcement that three women were pregnant with clones in November 2002, no mention was made of the first woman; the group's claims were widely greeted with skepticism.[72] No verified cloned baby has been revealed by the Consortium. Although neither the Consortium nor the Raelians/Clonaid have had a successful clone verified, their existence, support, and stated purpose are evidence of a strong desire among at least some groups to clone humans.

C. Inadequate Federal and State Legislation Focused on Prohibition

Comprehensive bans on reproductive cloning have been introduced several times in the U.S. Congress.[73] However, this legislation has yet to succeed, meaning that reproductive cloning remains free of federal law or regulation. Efforts to ban reproductive cloning have failed largely because of legislative inability to separate reproductive cloning from the issue of therapeutic cloning—that is, the creation of an early-stage clone of a person to use for individually matched organ provision or medical treatment.[74] While most legislators are opposed to reproductive cloning, there are substantial differences in opinion on therapeutic cloning, and the continuing entanglement of the two, in policy debates if not necessarily in scientific discourse, has

---

[70] Roger Moorgate, Report on the Human Cloning Conference (2001), *available at* http://library.thinkquest.org/C0121981/pages/g_report.htm.

[71] Emma Young & Damian Carrington, *Cloning Pregnancy Claim Prompts Outrage*, New Scientist, http://www.newscientist.com/article/dn2133-cloning-pregnancy-claim-prompts-outrage.html (April 5, 2002).

[72] '*Human Clone' Unlikely Say Experts*, BBC, November 27, 2002, http://news.bbc.co.uk/2/hi/science/nature/2517351.stm.

[73] *See, inter alia,* Human Cloning Ban and Stem Cell Research Protection Act of 2007, S. 812, 110th Congress (2007); Human Cloning Ban and Stem Cell Research Protection Act of 2005, S. 876, H.R. 1822, 109th Congress (2005); Human Cloning Ban and Stem Cell Research Protection Act of 2003, S. 303, 108th Congress (2003); Human Cloning Ban and Stem Cell Research Protection Act of 2001, S. 1893, 107th Congress (2001); Human Cloning Prevention Act of 2005, H.R. 4118, 109th Congress (2005); Human Cloning Prevention Act of 2003, H.R. 938, 108th Congress (2003); Human Cloning Prevention Act of 2001, H.R. 3495, 107th Congress (2001); Human Cloning Prevention Act of 1999, H.R. 571, 106th Congress (1999); Human Cloning Prohibition Act of 1998, S. 1601, 105th Congress (1998). *See generally* G. Vogel, *Science Policy. Cloning Bills Proliferate in U.S. Congress*, 292 Sci. 1037 (2001).

[74] Zhiming Han, Catherine A. Vandevoort & Keith E. Latham, *Therapeutic Cloning: Status and Prospects*, 9 Current Opinion in Molecular Therapeutics 392, 392-97 (2007).

led to legislative gridlock on the larger subject of human cloning.[75] Unsurprisingly, as Congress has failed to enact blanket bans or permissions regarding human cloning, it has also failed to enact any regulation or law on the practical situations of eventual human clones, whether focused on parental status or otherwise. It is likely that any Congressional efforts in this area would be bounded by federalism concerns, since family and property law are generally the purview of the states; the issue is nearly moot, however, since comprehensive regulatory action by Congress appears extremely unlikely in the near future.

In the absence of comprehensive federal regulation on human cloning, many states have enacted their own laws completely or partially banning cloning.[76] Thirteen states have completely banned reproductive cloning,[77] while two have prohibited the use of public funds for the purpose of reproductive cloning.[78] As a result of the focus on banning human clones, rather than addressing the situation of the future children that may arise from cloning, no state has enacted any sort of legislation directly considering the complex issues raised by human clones. The California Court of Appeals laid out the human risks to this approach when considering a complex surrogacy parentage tangle:

> No matter what one thinks of artificial insemination, traditional and gestational surrogacy (in all its permutations), and—as now appears in the not-too-distant future, cloning and even gene splicing—courts are still going to be faced with the problem of determining lawful parentage. A child cannot be ignored. Even if all means of artificial reproduction were outlawed with draconian criminal penalties visited on the doctors and parties involved, courts will still be called upon to decide who the lawful parents really are and who—other than the taxpayers—is obligated to provide maintenance and support for the child. These cases will not go away. [79]

In addition to the practical and human problems of considering clones only from the point of view of prohibition, this myopic focus has obscured the ways clones change

[75] George J. Annas, *Cloning and the U.S. Congress*, 346 New. Eng. J. Med. 1599, 1599-1602 (2002); Tabitha M. Powledge, *Will They Throw the Bath Water out with the Baby?: The US Congress is Still Debating Whether to Outlaw Cloning Humans*, 3 EMBO Reports 209 (2002).

[76] Jeffrey Brainard, *Cloning Debate Moves to the States: with an Impasse in Congress, Legislatures Are Now Facing Bills on Research*, 49 Chron. Higher Educ. A22, A22-23 (2003).

[77] The states that have completely banned human cloning are Arkansas, California, Connecticut, Indiana, Iowa, Maryland, Massachusetts, Michigan, New Jersey, North Dakota, Rhode Island, South Dakota, and Virginia. *See* National Conference of State Legislatures, State Human Cloning Laws, http://www.ncsl.org/programs/health/Genetics/rt-shcl.htm (Jan. 1, 2008).

[78] Arizona and Missouri are the states that forbid use of public funds. *See id.*

[79] *In re Marriage of Buzzanca*, 72 Cal. Rptr. 2d 280, 293 (Cal. Ct. App. 1998).

conceptions of family. The next section of this Article aims to explicitly consider both the practical and conceptual effects of human cloning on the modern family.

III. HUMAN CLONING AND THE COMMON LAW OF COMPLEX PARENTAGE.

The advent of current reproductive technologies, most significantly *in vitro* fertilization, and the surrogacy disputes that come with them, have given courts cause to more carefully consider the need for new definitions of the parent-child relationship. One leading and oft-cited line of cases, coming from California, holds that contested parentage should be determined by procreative-intent instead of the traditional amalgam of marriage, acknowledgement, or genetic paternity testing.[80] Another significant set of cases, originating with Ohio courts, has taken the genetic relationship to be paramount in situations of contested parenthood, ruling that the question of natural parentage should be determined solely on the basis of genetics.[81] The situation of human cloning—and the posited application of these tests to eventual human clones—reveals problems in these approaches unconsidered by the courts that developed them. The procreative intent test more flexibly fits around the contours of human cloning, and might be better at addressing future changes in reproductive technology, but at the same time it removes the biological constraints which limit cloning's potentially reprehensible possibilities. On the other hand, human clones demonstrate that the desirable simplicity of the pure genetics approach is actually not simple at all. Its application to human clones does not resolve the intuitional conflict of different human cloning situations, and its inability to resolve them shows a deeper and more problematic ambiguity in the definition of "genetic parent." In a broader sense, human cloning exemplifies the ways in which changing science and technology confound the courts' attempts to turn to science for consistent truths on which to found easily applicable rules in hard situations.

A. Importance of the Legal Parent-Child Relationship

We readily acknowledge the everyday significance of the parent-child relationship, but that relationship is usually conceived in a social context. If the primary importance of a parent-child relationship exists on a social and personal level, what impact does a legal definition of that relationship have? Cases like Rob and Junior are easily resolved at the level of instinct and intuition, and that may be what matters most in everyday life. In several important respects, however, the legally defined parent-child relationship can have significant impacts on the life of both parties.

A legal determination of parentage establishes both rights and responsibilities for the parents. In terms of rights and benefits, legal parents have the right of custody of their children, and can determine to a significant extent the progress of their child's

---

[80] *Johnson v. Calvert*, 851 P.2d 776 (Cal. 1993).

[81] *Belsito v. Clark*, 644 N.E.2d 760 (Ohio Ct. Pleas 1994).

education and upbringing.[82] Within limits,[83] parents can essentially control their children via legal means.[84] More generally, legal parents have significant protection from interference in their child-rearing, whether by third parties or the state.[85] Parental responsibilities are also significant; parents must provide shelter, food, medical care, clothing, and other necessities for their children;[86] parents who are not involved in the day-to-day rearing of their children are usually obligated to pay child support.[87]

For children, the legal parent-child relationship provides more in the way of benefits than responsibilities. Children benefit from the receipt of the parental obligations discussed above, including food and other necessities.[88] Outside of those necessities, children can derive other benefits from the legal parent-child relationship, including citizenship,[89] medical insurance coverage,[90] Social Security survivor benefits,[91] and, potentially, inherited property in situations of intestacy.[92] Children have little in the way of legal responsibilities towards their parents, instead submitting to a significant amount of control over daily life, and bearing potential social responsibility for the eventual elder-care.

---

[82] See generally Troxel v. Granville, 530 U.S. 57 (2000); Washington v. Glucksburg, 521 U.S. 702 (1997); Quilloin v. Walcott, 434 U.S. 246 (1978); Wisconsin v. Yoder, 406 U.S. 205 (1972); Prince v. Massachusetts, 321 U.S. 158 (1944); Pierce v. Soc'y of Sisters, 268 U.S. 510 (1925); Meyer v. Nebraska, 262 U.S. 390 (1923); see also 59 Am. Jur. 2d *Parent and Child* § 17.

[83] *Id.*; *see also Reno v. Flores*, 507 U.S. 292 (1993); *Gonzalez v. Reno*, 212 F.3d 1338, 1352 (11th Cir. 2000) (applying Florida law).

[84] 59 Am. Jur. 2d *Parent and Child* § 17.

[85] *Id.*

[86] *State v. Miranda*, 715 A.2d 680, 687 (Conn. 1998).

[87] Family Support Act of 1988, Pub. L. No. 100-485, 102.

[88] 59 Am. Jur. 2d *Parent and Child* § 17.

[89] 8 U.S.C. § 1401.

[90] Comm. on the Consequences of Uninsurance, Health Insurance is a Family Matter 22-45 (1st ed. 2002).

[91] 42 U.S.C. § 402.

[92] Unif. Probate Code § 2-103(1) (amended 2006). Clones can also raise particularly interesting questions in the area of posthumously conceived children inheriting or receiving Social Security survivorship benefits. *See generally* Joesph H. Karlin, *Daddy Can You Spare a Dime: Intestate Heir Rights of Posthumously Conceived Children*, 79 Temp. L. Rev. 1317 (2006). In normal situations of posthumous conception, the deceased parent consented at some point to the storage of eggs or sperm, while in cloning situations this minimal reproductive consent can be completely absent.

Overall, the legal parent-child relationship has significant benefits and costs on both sides. It may not carry the full panoply of implications that social assignment of parentage does, but it greatly influences the lives of all involved. At a level both broader and deeper, though, legal and social conceptions of parentage and the family influence each other over time.[93] The law can create legitimacy which becomes more widely accepted socially only later[94] or illegitimacy which leads to similar later social disapprobation.[95] Alternatively, some social change generally occurs, and is often necessary, before the law even takes notice of a problem, much less shifts its definition.[96] Establishing a causal relationship between legal and social change requires often-impossible disaggregation of intertwined effects, but that does not mean the interrelationship should be ignored. Instead, the potential social ramifications—and potential legal-social cyclical synergies, where changes in the two spheres reinforce and support each other over time—should lead us to even more closely examine changes in the law's definition of such socially definitive forms as the constitution of the family and individuals' identities as parents and children.

B. The Procreative-Intent Test and Its Problems.

Recently, courts in California have instituted just such changes in defining parents, moving away from definitions based in the traditional grounds of marriage and conception and relying instead on the procreative intent of the potential parents. Traditionally in Anglo-American law, parentage has been largely defined by marriage.[97] At common law, the mother of a child was easily determined, since before the advent of assisted reproductive technologies birth clearly established both gestational and genetic motherhood. Legal fatherhood was determined by marriage to the legal mother, which remains applicable today as the marital presumption;[98] marriage and birth still determine the legal parentage of a large proportion of children. More recently, legal definitions of

---

[93] For a general theory of the interactions between law and social norms, see Eric A. Posner, Law and Social Norms 272 (2002).

[94] Kathleen E. Hull, *The Cultural Power of Law and the Cultural Enactment of Legality: The Case of Same-Sex Marriage*, 28 L. & Social Inquiry 629, 629-657 (2003).

[95] Orma Linford, *Mormons and the Law: The Polygamy Cases,* 9 Utah L. Rev. 308, 328-29 (1964).

[96] Peggy Pascoe, *Miscegenation Law, Court Cases, and Ideologies of "Race" in Twentieth-Century America*, 83 J. Am. History 44 (1996).

[97] 1 William Blackstone, Commentaries *434, *434-447.

[98] *Michael H. v. Gerald D.,* 491 U.S. 110, 115 (1989) (upholding California statute stating that a child of a woman "cohabiting with her husband, who is not impotent or sterile, is conclusively presumed to be a child of the marriage") (*quoting* Cal. Evid. Code § 621(a) (1989)); *see also* Theresa Glennon, *Somebody's Child: Evaluating the Erosion of the Marital Presumption of Paternity*, 102 W. Va. L. Rev. 547 (1999).

fathers have come to encompass biological parentage outside the context of marriage, including voluntary acknowledgement of paternity outside the context of marriage, and DNA testing to demonstrate biological paternity—whether voluntarily acknowledged or not—inside or outside of a marriage.[99] These traditional definitions, based on birth, marriage, acknowledgement of paternity, and DNA testing to establish some version of biological paternity, have clearly defined the vast majority of parentage cases, and appear likely to continue to do so. They do not, however, cover all circumstances which can arise in the complex modern interplay between evolving technology and social relationships.

This lack of comprehensiveness becomes apparent in *Johnson v. Calvert*, where the California Supreme Court addressed a complex surrogacy situation not amenable to traditional definitions. Mark and Crispina Calvert were a married couple who wished to have a child genetically related to them (i.e., not adopted), but Crispina had undergone a hysterectomy.[100] They signed a surrogacy contract with Anna Johnson, and an embryo formed from Mark's sperm and Crispina's egg was implanted in Anna's uterus.[101] Anna agreed to forego all parental rights and to be paid by the Calverts for her gestational surrogacy.[102] After a deterioration of the relationship between Anna and the Calverts, each side sought declaratory judgment affirming parentage.[103] The court decided that:

> "[A]lthough the [Uniform Parentage] Act recognizes both genetic consanguinity and giving birth as a means of establishing a mother and child relationship, when the two means do not coincide in one woman, she who intended to procreate the child—that is, she who intended to bring about the birth of a child that she intended to raise as her own—is the natural mother under California law."[104]

The court reasoned that the intending parents were the first movers, the "but-for" causative agents, without whom the child would not have come into existence at all;[105]

---

[99] Dolgin, *supra* note 7, at 382-83.

[100] *Johnson v. Calvert*, 851 P.2d 776, 778 (Cal. 1993).

[101] *Id.* at 778.

[102] *Id.*

[103] *Id.*.

[104] *Id.* at 782.

[105] *Johnson*, 851 P.2d 776, 782 (Cal. 1993) (citing John L. Hill, *What Does it Mean to be a "Parent"? The Claims of Biology as the Basis for Parental Rights*, 66 N.Y.U. L. Rev. 353, 370 (1991)).

that bargained-for expectations about who would be parents should be controlling;[106] that the parents were the originators of the mental concept of the child;[107] and, finally, that the interests of the child are more likely to be aligned with the interests of the individuals who intended to bring the child into being.[108] On these grounds, the court held that the genetic mother, and not the gestational mother, was the natural and legal mother.

The *Johnson* opinion, and the procreative-intent test it laid out, has been criticized on several grounds.[109] Perhaps most fundamentally, in other contexts the courts have no problem assigning parentage without intent, most particularly in the recognition of paternity on the purely biological grounds of a DNA test.[110] Indeed, courts have assigned parentage where intent was actively denied, and in which the biological father had no desire to be a legal parent.[111] To use procreative-intent as a determinative test for natural parentage in complex assisted reproductive systems seems, if not actively contradictory to biological determination of parentage, at least evidence of a countervailing policy argument.

Several other criticisms were levied against the opinion, most immediately in the dissenting opinion by Justice Kennard.[112] In his opinion, he pointed out several problems with the majority's reasoning: that gestational mothers are also certainly substantial causes of the child's coming into being;[113] that both bargaining and concept origination rationales tend to treat children as property;[114] and, finally, that the interests of the child can best be addressed by considering them directly, instead of considering the interests of

---

[106] *Id.* at 783 (citing Marjorie Shultz, *Reproductive Technology and Intent-Based Parenthood: An Opportunity for Gender Neutrality*, 1990 Wis. L. Rev. 297, 323 (1990)).

[107] *Id.* at 782 (citing Andrea E. Stumpf, *Redefining Mother: A Legal Matrix for New Reproductive Technologies*, 96 Yale L.J. 187, 197-202 (1986)).

[108] *Id*. at 783 (citing Schultz, *supra* note 106, at 397).

[109] *See*, *e.g.*, Jeffrey M. Place, *Gestational Surrogacy and the Meaning of "Mother": Johnson v. Calvert, 851 P.2d 776 (Cal. 1993)*, 17 Harv. J.L. & Pub. Pol'y 907, 913 (1994) ("Courts should make genetics the primary determinant of maternal rights."); Timothy Walton, *Splitting the Baby: A Note on Johnson v. Calvert*, 1 U.C. Davis J. Juv. L. & Pol'y 24, 29-30 (1996) (arguing that the best interests of the child is a better test); Douglas S. Irwin, *Maternity Blues: What About the Best Interests of the Child in Johnson v. Calvert?*, 24 Sw. U. L. Rev. 1277, pincite (1995) (same).

[110] Unif. Parentage Act § 505 (amended 2002), 9B U.L.A. 309 (Supp. 2009).

[111] Jacobs, *My Two Dads*, *supra* note 7, at 822-26 (citing *Child Support Enforcement Agency v. Doe*, 125 P.3d 461, 463 (Haw. 2005)).

[112] *Johnson v. Calvert*, 851 P.2d 776, 789 (Cal. 1993) (Kennard, J., dissenting).

[113] *Id.* at 795-96.

[114] *Id.* at 796-97.

the parents as an automatic proxy.[115] The dissent also pointed out that permitting intent to control natural parentage determinations in surrogacy agreements effectively approves surrogacy agreements,[116] but without the procedural safeguards which are mandated in adoption situations and suggested in surrogacy situations.[117] This, Justice Kennard argued, opens the door to substantial possibilities of abuse.[118] These criticisms, while not as fundamentally challenging as the frequent exclusive use of biology to assign parentage in other circumstances, nonetheless question the use of reproductive intent as a panacea for problems resolving complex reproductive situations.

Despite these challenges, the *Johnson* procreative-intent test seems to resolve the issues that arise with genetic parentage assignment in the cloning paradigm cases of replacement children and infertile couples. The test was developed and applied in the situation of an infertile couple wishing a genetically related child (Junior), and its result there accords with our intuition, since the infertile couple intends to have the child. Furthermore, the procreative intent test result matches our intuition with a replacement child (Rob) —there, the deceased child's interposition within the genetic relationship has no effect on the assignment of natural parentage, because the intuitive parents intended to have the child. The procreative-intent test neatly resolves the disparity between intuition and biology by removing biology from the picture, which in this situation seems to cause few problems.

The *Johnson* holding, however, has been applied in California significantly beyond its original fact pattern, and its broader applications as a parentage test are challenged by the possibility of human cloning. The original holding—that procreative intent can function as a tiebreaker between genetic and gestational parentage—was broadened in *In re Marriage of Buzzanca*.[119] There, the Buzzancas, unable to conceive children on their own, used anonymously donated sperm and eggs to create an embryo, which was then implanted in a surrogate.[120] Later, the marriage soured, and none of the three original principals wished to be the parent of the child.[121] The Fourth District Court of Appeal ruled that the procreative-intent test from *Johnson* controlled, and that the

[115] *Id.* at 798-800.

[116] *Id.* at 798.

[117] Governmental approval in surrogacy situations is suggested by the Uniform Status of Children of Assisted Conception Act, which was not adopted in California. *See* Unif. Status of Children of Assisted Conception Act § 5 (1988), 9C U.L.A. 370 (2001) *superceded by* Unif. Parentage Act § 201 (amended 2002), 9B U.L.A. 309 (Supp. 2009).

[118] *Id.*

[119] *In re Marriage of Buzzanca*, 72 Cal. Rptr. 2d 280, 282-83 (1998).

[120] *Id.*

[121] *Id.*

Buzzancas were the parents based on that original procreative-intent, even though they had neither genetic nor gestational relationships to the child.[122]

This application to situations where the intending parents have neither genetic nor gestational relationships with the child—that is, where there is no biological basis to the relationship—raises novel issues in the context of human cloning. In all other forms of parentage, there are controls on the potential parents' ability to choose a child. In adoption cases, the state strictly supervises the assignment of parentage.[123] In other forms of natural parentage, parents are limited in their choice by the vagaries of genetics in combining contributions from two individuals—whether themselves or known or anonymous donors—and, in the case of gestational motherhood, by the biology of gestation itself. With human clones, and under the procreative-intent test, these constraints vanish; parents are natural parents of whomever they may clone and a surrogate may bear. This would mean, to take an extreme example, that a set of parents who contracted with twenty surrogates to bear clones of twenty dictators would, in fact, be the natural legal parents of those clones. It may seem a slight defense against abusive procreative cloning to state merely that some biological relationship is required alongside intent, but on the other hand, legal recognition of the parent-child relationship by a judicial test could offer a powerful approbation of behavior generally deemed reprehensible. Less immediately but more significantly, judicial approval of otherwise problematic practices may lead to changes in social norms and eventual acceptance, as discussed above.[124]

Another aspect of the same problem arises from the notion of consent. Strong arguments have been made for the right of an individual to consent to the use of his or her genetic material in the creation of a child.[125] Use of genetic material without consent

---

[122] *Id.*

[123] *See*, *e.g.*, N.Y. State Office of Children & Family Servs., The Adoption Process, http://www.ocfs.state.ny.us/adopt/process.asp (last visited July 9, 2010).

[124] *See supra* note 93 and accompanying text.

[125] *Belsito v. Clark*, 644 N.E.2d 760, 766 (Ohio Ct. Pleas 1994) ("The procreation of a child, that is, the replication of the unique genes of an individual, should occur only with the consent of that individual.") (citing *Davis v. Davis*, 842 S.W.2d 588, 601-02 (Tenn. 1992) ("[H]owever far the protection of procreational autonomy extends . . . decisional authority rests in the gamete-providers alone, at least to the extent that their decisions have an impact upon their individual reproductive status.")). In Canada, this consent requirement is clarified by statute:

> (1) No person shall make use of human reproductive material for the purpose of creating an embryo unless the donor of the material has given written consent, in accordance with the regulations, to its use for that purpose.
> (2) No person shall remove human reproductive material from a donor's body after the donor's death for the purpose of creating an embryo unless the donor of the material has given written consent, in accordance with the regulations, to its removal for that purpose.

raises complex issues of autonomy on the one hand and appropriation on the other, though the latter argument brings up troublesome shades of commodification. When human clones are involved, the matter becomes more pressing, since rather than a random selection of genetic material, the genetic donor provides essentially[126] the entire genetic complement for the new individual. These issues are absent from the *Johnson* decision, which is unsurprising since consent was present. A procreative-intent rule without a genetic consent requirement, however, has problems for parentage determination in general and for clones in particular.

Practically speaking, in addition to challenges of administration, the combination of an intent test with cloning opens new potentially problematic forms of parenthood. Overall, however, the *Johnson* intent test effectively skirts some of the theoretical complexities raised by human clones; where cloning points toward insufficient disaggregation of biological parentage, *Johnson* avoids the problem by prioritizing instead the social side of parentage. Despite this theoretical elegance, recognition of the intent test's administrative difficulties has led other courts to the development of a different test designed for simpler answers.

C. The Direct Genetic Test and Its Problems

In lieu of potentially complicated determinations of procreative-intent, reliance on genetics as the determinant of parentage offers an attractive simplicity in situations of complex potential parent-child relationships, including when the genetic and gestational mother are different individuals. In Ohio, the courts have embraced this apparent simplicity. In *Belsito v. Clark*, Shelly Belsito was unable to bear children due to a hysterectomy; however, her egg and her husband's sperm were used to create an embryo which was implanted in her sister, Carol Clark.[127] Carol stated that she had no desire to be the child's mother and would be no more than the child's aunt.[128] Under Ohio law at the time the gestational mother would be named the mother on the birth certificate, and since Carol Clark was not married to Anthony Belsito, the child would be considered illegitimate, with no father on the birth certificate.[129] To avoid this, and the necessity of adopting their genetic child, Shelly and Anthony requested a declaratory judgment that

> (3) No person shall make use of an in vitro embryo for any purpose unless the donor has given written consent, in accordance with the regulations, to its use for that purpose.

Assisted Human Reproduction Act, 2004 S.C., cl. 2, § 8 (Can.). Notably, the same statute explicitly bans any human cloning in Canada. *Id*. at § 5(1).

[126] *See infra* Part III.C.2 for a discussion of the genetic differences between clones and their genetic donor.

[127] *Belsito v. Clark*, 644 N.E.2d 760, 761 (Ohio Ct. Pleas 1994).

[128] *Id.*

[129] *Id.* at 762.

they were the genetic parents of the child.[130] The court granted their judgment, holding that "[t]he test to identify the natural parents should be, 'Who are the genetic parents?'"[131]

The *Belsito* court's reasoning had three stated major prongs: the difficulty in applying an intent-based test, the right of a genetic parent to consent to procreation or surrender potential parental rights, and public policy concerns about privately contracting the surrender of parental rights and about state-supervised adoption.[132] The court's reasoning has been criticized on several grounds;[133] this Article will not rework those prior critiques. Instead, it will turn to the ways in which the unconsidered situation of human cloning illustrates the problems in the underlying assumptions of the *Belsito* decision to rely on genetics. More specifically, the *Belsito* court recognized that biological parentage could be not only split from social parentage but further divided into gestational and genetic parentage, and chose to set the onus of complex parentage entirely on the genetic aspect of biological parentage. Human clones, though, demonstrate that genetic parentage itself is a malleable concept, still divisible and devoid of the simplicity sought in *Belsito*'s turn to scientific definition.

1. The Inadequate Definition of "Genetic Parent"

A significant rationale for the *Belsito* decision was the clarity of a genetic test. Genetically, every individual is defined by two sets of 23 matched chromosomes, each taken from one individual as a set. For all reproduction besides cloning—that is, all sexual reproduction[134]—one set obviously comes from each parent. These individuals can be determined through genetic testing, as in situations of uncertain paternity. The definition of "genetic parents," therefore, is relatively uncontested up to this point; there has been little reason to argue over precision.[135] When human clones are considered, the definition of "genetic parents" becomes a central and immediate issue. Different possible definitions and their strengths will be discussed in more detail in Part V.A, *infra*, but for the current discussion, the analysis will assume the definition the *Belsito* court most probably had in mind. Based on the court's description of genetics as a modern view of

---

[130] *Id.*

[131] *Id.* at 766.

[132] *Id.* at 764.

[133] *See*, *e.g.*, Michelle Pierce-Gealy, "*Are You My Mother?": Ohio's Crazy-Making Baby-Making Produces a New Definition of* "*Mother"*, 28 Akron L. Rev. 535 (1994).

[134] Sexual reproduction here refers to a broader swath of activity than merely intercourse, describing any reproduction which involves the combination of half-genomes from two individuals to create a full genome. In this sense, sexual reproduction differs from asexual reproduction methods like budding of yeast cells, bacterial fission (splitting in half), the original cloning (taking twigs from trees to grow new trees), or modern technological cloning.

[135] **This Footnote is a placeholder.**

blood relations, and the analysis of genetic traits as evidence of parentage, the most likely definition of "genetic parents" would point to the two individuals who contributed the two sets of chromosomes. However, consideration of the two archetypal cases from this Article's beginning show the problem with this apparently reasonable definition.

For Rob, the "replacement child," the *Belsito* test gives results that match our intuition. Since Rob derives both sets of chromosomes from the deceased child, he will have one set of chromosomes from each of the original parents; the genetic relationship is identical to that of the deceased child, which matches both the parents' intent and our external intuition. For Junior, however, this logic gives a counterintuitive and counter-intentional answer: since Junior is genetically identical to the cloned member of the couple, he is the genetic child of the genetic donor's parents—that is, the individuals we would intuitively consider his paternal grandparents. Another potential example—admittedly more extreme and less sympathetic—shows the bizarre potential results of the test. In the case of a third party clone of a previously unrelated individual, like the score of dictator replicas posited above, the clone would remain the genetic child of the original individual's genetic parents, who may have no relation whatsoever to the individuals who proximally caused the clone to be made and born. Even were these counterintuitive results acceptable, though, consideration of human clones raises further issues regarding the complexity of genetic parentage assignment by demonstrating that even when individuals are as close to identical as science can make them, genetic differences still arise.

2. Genetic Differences Between Clones and Donors

All but the most dystopian descriptions of clones recognize that clones will not be identical to their donors because of differing environmental variables.[136] These include *in utero* nutrient variations, parenting patterns, or any of the other myriad factors broadly classified as the "nurture" of "nature vs. nurture."[137] Even identical twins raised in the same family are not actually identical,[138] and those are closer clones than any artificial clones could ever be, since they share both *in utero* and developmental environments. In animals, the first commercially cloned cat was compared at one year from birth with its

---

[136] For examples of the many studies examining environmental and genetic factors impacting differences between identical twins, see, e.g., Dorret Boomsma, Andreas Busjahn & Lenna Peltonen, *Classical Twin Studies and Beyond*, 3 Nature Revs. Genetics 872, 872-882 (2002); Jaakko Kaprio & Markku Koskenvuo, *Genetic and Environmental Factors in Complex Diseases: The Older Finnish Twin Cohort*, 5 Twin Res. & Human Genetics 358, 358-65 (2002); John C. Loehlin & Robert C. Nichols, Heredity, Environment, & Personality: A Study of 850 Sets of Twins (1976); Hans J. Eysenck, *Genetic and Environmental Contributions to Individual Differences: The Three Major Dimensions of Personality*, 58 J. Personality 245, 245-61 (1990).

[137] *See supra* note 134.

[138] Gregory A. Machin, *Some Causes of Genotypic and Phenotypic Discordance in Monozygotic Twin Pairs*, 61 Am. J. Med. Genetics 216, 216-28 (1996).

genetic progenitor, and significant differences were noted.[139] Aside from the "nurture" factors—that is, external environmental variables—it is important to note that the "nature" factors, including the core genetic factors, are not completely identical between clones.[140] Two differences, mitochondrial DNA and epigenetic gene programming, separate most artificial clones at the genetic level, and further complicate the conception of genetic relationships used in *Belsito*.

Contrary to common belief, DNA exists in the cell outside the nucleus. The nucleus houses the twenty-three pairs of chromosomes that are normally thought of as the genetic makeup of an individual—but several significant genes are found outside the nucleus in the cell's mitochondria. Mitochondria are small organelles that, among other functions, produce energy for the cell.[141] Unlike other mammalian organelles, mitochondria have their own DNA, which is used in addition to the DNA in the cell's nucleus to produce mitochontrial proteins.[142] In fact, mitochondrial DNA codes for thirteen mitochondrial protein products and twenty-four mitochondrial RNA genes.[143] Since mitochondrial DNA is located in the mitochondria, not in the nucleus, and sperm only contribute nuclear DNA, a fertilized egg gets its mitochondrial DNA exclusively from the mother. Similarly, the egg used as the recipient of a new nucleus in an instance of cloning via SNT likewise carries mitochondrial DNA from the woman who produced the egg, not from the donor of the nucleus and the rest of the cell's genetic material.

This has potentially significant implications for the clone in physical terms, since variations in mitochondrial DNA have been linked with longevity[144] and several disease conditions.[145] However, in terms of sheer informational volume, mitochondrial DNA is

---

[139] 1 Year Later: Cat, Clone Differ, USA Today, January 21, 2003, *available at* http://www.usatoday.com/news/science/2003-01-21-cloned-cats_x.htm.

[140] For a more technical overview of this topic, see R. G. Edwards & Helen K. Beard, *How Identical Would Cloned Children Be? An Understanding Essential to the Ethical Debate*, 4 Human Reprod. Update 791, 791-811 (1998).

[141] Heidi M. McBride, Margaret Neuspiel & Sylwia Wasiak, *Mitochondria: More Than Just a Powerhouse*, 16 Current Biology R551, R551-60 (2006).

[142] S. Anderson et al., *Sequence and Organization of the Human Mitochondrial Genome*, 290 Nature 457, 457-65 (1981)

[143] *Id.*

[144] Stefano Salvioli et al., *The Impact of Mitochondrial DNA on Human Lifespan: a View from Studies on Centenarians*, 3 Biotech. J. 740, 740-49 (2008); Aurelia Santoro et al., *Mitochondrial DNA Involvement in Human Longevity*, 1757 Biochimica Et Biophysica Acta 1388, 1388-99 (2006).

[145] Robert W. Taylor & Doug M. Turnbull, *Mitochondrial DNA Mutations in Human Diseases*, 6 Nature Revs. Genetics 389, 389–402 (2005); Salvatore Dimauro & Eric A. Schon, *Mitochondrial DNA and Diseases of the Nervous System: The Spectrum*, 4 Neuroscientist 53, 53-63 (1998); Andrew M. Schaefer et al., *Prevalence of Mitochondrial DNA Disease in Adults*, 63 Annals of Neurology 35, 35-39 (2008).

dwarfed by a cell's nuclear genetic component. The human genome has over 20,000 protein coding genes,[146] meaning that mitochondrial DNA codes for well less than 1% of human genes. This leads to the again counterintuitive result that in terms of absolute information, an individual is defined almost exclusively by nuclear DNA—but the little information held in mitochondrial DNA can still have life-altering implications. Here again, the example of human clones shows the ambiguousness of supposedly clear genetic definitions, and how those can prove practically unworkable with new reproductive technologies.

Aside from the genetic differences of mitochondrial/nuclear DNA, relatively recently discovered factors can result in heritable changes which are not genetic in nature. The developing field of epigenetics studies changes in gene expression which are based on anything besides a change in the underlying DNA sequence.[147] This includes modifications made to a cell's DNA which can influence, among other things, which copy of a gene (maternal or paternal) is activated, or which of multiple possible genetic disease syndromes occurs,[148] all of which have potentially life-changing effects on offspring. Epigenetics can even lead to heritable changes based on parental life events—famine, food abundance, and the onset of smoking have all been shown to have trans-generational effects without any change in DNA.[149] This starts to call into question the use of genetics itself as an all-encompassing term for biological heritability,[150] and shakes yet again the underpinnings of the *Belsito* test's sought clarity.

Clones, and the scientific changes for which they stand proxy, show the serious problems with both specific approaches to determinations of complex parentage. Cloning allows a procreative-intent test to determine situations far beyond the recent changes to the traditional family, leaving open the possibility of completely biologically unconnected individuals being considered legal parents without any state oversight or intervention. The opposite approach, focusing purely on genetic connections, has even deeper problems revealed by considering human clones, since the blunt concept of a "genetic parent" is neither clear nor constant, especially in light of constantly changing

---

[146] Int'l Human Genome Sequencing Consortium, *Finishing the Euchromatic Sequence of the Human Genome*, 431 Nature 931, 931-45 (2004).

[147] *See generally* C. David Allis et al., Epigenetics (1st ed. 2007).

[148] *Id*.

[149] Marcus E Pembrey et al., *Sex-Specific, Male-Line Transgenerational Responses in Humans*, 14 Eur. J. Human Genetics 159, 159-66 (2006).

[150] Recent studies have made this point explicit, examining differences between genetically identical organisms which arise from epigenetic differences. *See, e.g.*, Art Petronis, *Epigenetics and Twins: Three Variations on the Theme*, 22 Trends in Genetics 347, 347-50 (2006); M ario F. Fraga et al., *From The Cover: Epigenetic Differences Arise During the Lifetime of Monozygotic Twins*, 102 Proc. Nat'l Acad. Scis. 10604, 10604 (2005); Art Petronis et al., *Monozygotic Twins Exhibit Numerous Epigenetic Differences: Clues to Twin Discordance?*, 29 Schizophrenia Bulletin 169, 169 (2003); Albert H. C. Wong, Irving I. Gottesman & Art Petronis, *Phenotypic Differences in Genetically Identical Organisms: the Epigenetic Perspective.*, 14 Human Molecular Genetics R11, R11 (2005).

science. The problems in defining modern parenthood, however, are not limited to these two approaches: the general framework underlying these decisions demonstrates the same sort of concerns.

IV. STEPPING BACK: CLONES AND THE UNIFORM PARENTAGE ACT.

Clones demonstrate the problems with specific common law approaches to determining parentage, but they also reveal the challenges in creating a comprehensive framework from which courts can work. The Uniform Parentage Act (UPA) was drafted in 2000 to carefully and comprehensively define the parent-child relationship.[151] In response to a federal mandate to provide a way to determine paternity, it has been adopted in large part by 9 states; all other states have enacted some earlier form of a uniform parentage act, none of which are broader in their sweep over assisted reproduction issues.[152] Even the broadest outlines of the UPA, however, show the problems of basing comprehensive legislation on the grounding of shifting science. The UPA's structure centers on an amalgam of traditional marriage and voluntary acknowledgement, codifying the definitions the California courts found essentially inadequate in *Johnson*. Even when the UPA addresses modern technology, in sections on assisted reproduction and gestational agreements, it remains grounded in the technology of the present and the past, lacking the deep reconceptualization needed for true comprehensiveness. Practically, for human clones, this means that they either fall into some category by virtue of other characteristics, or that they slip through the cracks of the statutory conception. Conceptually, much of the problem stems from the law's repeated focus on viewing genetic relationships as a clearly defined component of traditional parentage sources, and not as the set of the malleable definitions that clones show them to be.

Marriage provides the most traditional way to determine parentage within the UPA—birth and the marital presumption determine parentage for many children, as has long been the case. When human cloning functions merely as a novel assisted reproduction technique within the context of a marriage, the UPA clearly assigns parentage of the clone to the married couple. If a clone is implanted into a wife, the mother-child relationship will be established by her carrying the child to term,[153] and her husband will be the legal father under the marital presumption.[154] Clones within a marriage are covered, then, but not by virtue of consideration of their special and different characteristics. Instead, they fit into a preexisting category without considering

[151] Unif. Parentage Act § 201 (amended 2002), 9B U.L.A. 309 (Supp. 2009); *see also* J. Brad Reich & Dawn Swink, *You Can't Put the Genie Back in the Bottle: Potential Rights and Obligations of Egg Donors in the Cyberprocreation Era*, 20 Alb. L. J. Sci. & Tech. 1, 26 (2010).

[152] *See* Reich & Swink, *supra* note 150, at 26.

[153] Unif. Parentage Act § 201(a)(1) (amended 2002), 9B U.L.A. 309 (Supp. 2009).

[154] *Id.* at § 204(a)(1-4).

whether other factors—genetic relationships, consent of the genetic donor, or other social features—should influence their categorization.

Outside the marital presumption, the primary method of establishing the legal father-child relationship under the UPA is a voluntary acknowledgement of paternity.[155] However, the language of the section reveals its inextricability from traditional forms of begetting: this section only allows voluntary acknowledgement by "a man claiming to be the father of the child conceived as the result of his sexual intercourse with the mother."[156] In the situation of human reproductive cloning, as with any other assisted reproductive technology, this is obviously not the case, since no sexual intercourse is involved in the conception of the child.

Once situations outside the ambit of traditional parentage questions—marriage or children otherwise conceived through sexual intercourse—arise, the language of the UPA struggles to conceptualize the application of science to create lasting definitions. In particular, the UPA includes sections on both assisted reproduction and gestational agreements—but these sections are so firmly rooted in the science at the time of drafting that they form an exceptionally poor fit to the circumstances of human clones.

Article 7 of the UPA governs parentage in situations of assisted reproduction, and would therefore be the most likely section to govern the parentage of human clones. But Article 7 focuses only on assisted reproduction involving a sperm and an egg.[157] The language fails to anticipate future reproductive techniques, and this problem arises immediately, since cloning does not involve the union of a sperm and an egg. Even in trying to expand beyond traditional conceptions, the UPA clings to that tradition, using it to define and encapsulate the science of the day.

Likewise, Article 8 of the UPA governs gestational agreements, where a woman agrees to carry a child to term for another set of parents. This situation, too, is quite likely to arise in human cloning, particularly in the context of couples where neither member can carry the child. Normally, a gestational agreement can be enforced, and will legally establish parent-child relationships for the couple in the agreement.[158] However, for a gestational agreement to be enforced, a court must approve it beforehand.[159] Given that human reproductive cloning is currently widely disfavored, it seems quite unlikely that any early cases of human clones will be brought to the courts before the cloning and gestation take place.

Essentially, the UPA attempts comprehensiveness by encirclement of the possibilities envisaged at the time of drafting, relying heavily on the science of the time. Specifically with regard to the genetic component of parentage, the UPA assumes as settled a set of definitions that can and will shift over time. As science changes, and with it the amalgam of aggregated definitions it grounds, the UPA is left behind, leaving

---

[155] *Id.* at Art. 3.

[156] *Id.* at § 301.

[157] *Id.* at §§ 703, 706-07.

[158] Under the UPA, there must be two parents in a gestational agreement. *Id.* at § 801(b).

[159] Unif. Parentage Act § 809(a) (amended 2002), 9B U.L.A. 309 (Supp. 2009).

courts with little statutory grounding to address the complexities of these situations once they inevitably arise.

V. IMPLICATIONS AND RECOMMENDATIONS

The social and genetic complexities of human clones reveal problems in the underlying concepts of family relationships, as well as both general and specific ways of determining legal parentage. Aside from the clear failure of the UPA's attempt at a comprehensive framework, human clones problematize both the procreative-intent test and the pure-genetics test—but these problems sit at opposite ends of the judicial process. Clones challenge the pure-genetics test at the most basic level, the definitions which provide the conceptual grounding for even considering the phrase "genetic parents," before any weighing or balancing by the courts. Cloning complicates the procreative-intent test, on the other hand, by shifting incentives for potential parents and by adding new potential factors that could arise in a court's analysis. In both conceptual locales, a consideration of cloning requires a reexamination of what we view as the key elements of parentage, especially if defined biologically. Which approach to determining complex parentage provides a better answer to changing technology depends on which approach better allows courts—and society—to flexibly address those changes while maintaining conceptual and jurisprudential consistency.

A. Changing Science and Technology and the Foundational Concepts Underlying Legal Rules

The *Belsito* rule is facially clear and straightforward: "[t]he test to identify the natural parents should be, 'Who are the genetic parents?'"[160] Unfortunately, as discussed *supra* in Part II.C.1, the test relies on a term, "genetic parents," which has no clear definition, and where the most likely definition shows immediate flaws when faced with the new technology of human clones. Without a clear and accurate definition of its underlying scientific terms, the *Belsito* test loses the very simplicity and specificity that led the court to choose it.

An obvious but ultimately flawed answer to the challenge of faltering definitions arises: why not just change the definitions to match the science? This provides a particularly attractive solution if the potential change can clearly and simply answer the ambiguity—especially if the change in science can be viewed as a "one-off" change. In the case of the pure genetics test, cloning might be the last step in reproductive technology, so that one change in definitions allows the rule to function properly. In that case, the term "genetic parent" could reasonably be defined in at least two ways. A genetic parent could be "an individual who contributes exactly one half of the genetic information contained in the nuclear[161] DNA of the genetic child."[162] This definition

[160] *Belsito v. Clark*, 644 N.E.2d 760, 761 (Ohio Ct. Pleas 1994).

[161] The inclusion of "nuclear" in the definition removes mitochondrial DNA as a potential source of genetic parentage, as discussed *supra* in notes 141-146, and accompanying text.

focuses on informational rather than physical inheritance ("blood" instead of "flesh") and matches our intuition for Rob, the replacement child, but not Junior, child of the infertile couple. A genetic parent could alternately be defined as "an individual who contributes nuclear DNA to the genetic child;" this definition reverses the emphasis from information to physical, and matches intuition on the infertile couple but not the replacement child. It is hard to conceive of a definition that matches our intuition in both cases, but at least, the argument goes, a reworked definition can provide clarity underlying the pure genetics rule.

Merely reworking underlying definitions inadequately addresses changing science. Even if a definition is sufficiently nuanced to account for current technology and current intuitions, new technological developments will challenge the definition and require new nuances—some of which may be either unpalatable or actually impossible. The steady march of science and technology strongly suggests that redefinitions will rarely actually be "one-off." The definitions above for genetic parents may succeed in providing clarity for clones—even if they have flaws in terms of successfully matching intuition—but plausible scientific changes can again muddle the test under this definition. A near-term example comes in the field of prenatal gene therapy, where the fetal DNA encoding a defective protein is replaced by DNA which encodes the normal protein.[163] Under either of the definitions above, this would make the person from whom the functional DNA is taken a genetic parent. Another innovation would confuse the definition even further: more than two individuals may eventually be able to contribute substantial amounts of nuclear DNA to an embryo.[164] Chromosomes have been movable by micromanipulation for many years;[165] therefore, chromosomes from multiple individuals could theoretically be combined to create a complete set of nuclear DNA, which could then be inserted into an enucleated egg to create an embryo. What reasonable definition of "genetic parent" could determine how a court, or any other entity, should assign parentage in such a case?

Cloning and the other potential forms of reproduction just discussed are undoubtedly at the extreme of a technological continuum which moves from that end through IVF and surrogacy to unassisted conception through sexual intercourse. The

---

[162] This definition might raise interesting and unexpected questions—for instance, does it cause problems for trisomy-21 (Downs syndrome) children, since one parent contributes two copies of chromosome 21, and therefore more than half of the child's nuclear DNA? The precise wording of an effective definition is itself challenging. However, the challenges cloning and new reproductive science brings to creating definitions are of a different kind.

[163] Holm Schneider & Charles Coutelle, *In Utero Gene Therapy: the Case For*, 5 Natural Med. 256, 256-57 (1999).

[164] For a description of some possibilities for artificially combining genetic material *in vitro* in the context of homosexual couples, see D. Orentlicher, *Beyond Cloning: Expanding Reproductive Options for Same-Sex Couples*, 66 Brook. L. Rev. 651, 651 (2000).

[165] David A. Begg & Gordon W. Ellis, Micromanipulation Studies of Chromosome Movement: I. Chromosome-Spindle Attachment and the Mechanical Properties of Chromosomal Spindle Fibers, 82 J. Cell Biology 528, 528–51 (1979).

definitional problems they raise, however, point to issues within a greater swath of that continuum, often with much less straightforward analyses.

Recent situations in Britain involving surrogacy and, in one instance, "regular" intercourse following a transplant exemplify other situations where the straightforwardness of genetic definitions is challenged. In one instance, the wife of a sterile husband used a sperm donation from her husband's father to initiate a pregnancy,[166] leading to a genetic father who filled the social and legal role of grandfather, and a social and legal father who had half the usual genetic relationship with his child.[167] In a complementary situation, a wife with a hysterectomy but viable eggs, like Crispina Calvert and Shelly Belsito, created an IVF embryo with her husband's sperm, which was then carried to term by her mother;[168] there, the genetic grandmother is the gestational mother, while the genetic mother and gestational sister takes on the legal and social role of mother.[169] A third case raises similar complexities, but with traditional conception: a woman received an ovarian transplant from her identical twin, then proceeded to conceive and bear a child.[170] Physically the genetic material for the child came from the gestational mother's sister, but informationally, the child's genetic material is in fact identical to that of every cell in the gestational mother's body; here, as in cloning, "flesh" and "blood" lead to potentially conflicting conclusions. Outside this particularly odd situation, ovarian and testicular transplants generally create situations where informational/genetic, biological/physical, and social parentage can be uncoupled, and where supposedly simple definitions based in genetics fail to successfully resolve complex issues.

The examples above, drawn from the spheres of both potential scientific advances and real current situations, show the significant problems with forming legal rules that merely apply definitions supplied by rapidly changing science. The *Belsito* court turned to scientific surety as a source of clarity, a modern codification of long-standing precedent. The changes in that science, and the ways that those changes at the technological extremes point to issues in more mainstream areas of the technological

---

[166] Man Donates Sperm for Grandchild, BBC, October 5, 2007, http://news.bbc.co.uk/2/hi/health/7030267.stm.

[167] Geneticists typically describe the strength of genetic relationships (the coefficient of relationship, denoted R) as the fraction of shared genes; each traditional parent contributes half of their genome to their child, leading to an R of ½; grandparents have an R of ¼, siblings ½, and identical twins and clones have an R of 1.

[168] Twins for Surrogate Grandmother, BBC, January 30, 2004, http://news.bbc.co.uk/2/hi/health/3441939.stm.

[169] This situation differs from other instances where a daughter donates oocytes to her mother, with the mother intending to bear and raise the child. *See, e.g.,* Lorna A. Marshall, *Intergenerational Gamete Donation: Ethical and Societal Implications*, 178 Am. J. Obstetrics & Gynecology 1171, 1171-76 (1998).

[170] Baby Born after Ovary Transplant, BBC, November 12, 2008, http://news.bbc.co.uk/2/hi/health/7724212.stm.

continuum, show that such a turn to science yields results that are anything but clear. Rules based just on that science can have counterintuitive applications while maintaining clarity—or can become so muddied by complexity that they lose all usefulness and becomes a hindrance rather than a help.

B. Changing Science and Technology as Elements of Judicial Balancing

Changing science and technology cannot reveal invariable truths on which courts can rely to mechanically decide cases; they can, however, provide evidence germane to making a decision based on other factors as well. Requiring some biological link for an assignment of natural parentage would help restrict the potential negative outcomes that could arise from the *Johnson* procreative-intent rule, for instance. A compromise at the balancing stage might require parents to have some biological link to children (or at least a second-degree link through a spouse or partner), or else require state approval, similar to adoption proceedings. Alternately, the *Johnson* approach could be adapted to require the explicit consent of the source of the genetic material (with the admitted complexities that blunt characterization raises). Either of these approaches—or some combination of the two—would allow courts more leeway to determine what adequate biological links or sufficient consent means in the case at hand, taking into account the changing state of reproductive science, and still to weigh that against the social parameters that ultimately frame and shape the question of family relationships.

VI. CONCLUSION

The larger issue here is the clash between biology/genetics as a primary determining factor of identity and the idea that families are defined by choice and intent. The conflict between these two spheres, once made effectively indistinguishable by the overwhelming prevalence of the traditional family, is reemphasized and enhanced by modern reproductive technologies. More than any other immediately looming technology, the potential creation of human clones strips away many of the factors which obscure the issue in other contexts. In clones, for the first time, genetics, gestation, and intention are both completely controlled and completely separable.

The advent of human clones reveals something else in the way courts and lawyers think about family. The rise of surrogacy—and the more recent rise of gestational surrogacy, where genetics can for the first time be made distinct from pregnancy—has led courts to consider the social institutions surrounding parentage, and to look for new ways to define the parent-child relationship when older concepts fail to deal with modern complexities. Some courts have turned to further social definitions to resolve these issues, relying on procreative-intent, and choice as the determinant of the modern family. Others have turned to science, looking for truth and authority in a genetic conception of parentage—if science can provide a descriptive answer, then courts need not make a normative decision. Ultimately, however, the construction of the family—especially the modern family—relies, and must rely, more on social choices than on scientific determinations. This is especially clear when the science is changing, and answers that appear obvious one year may be just as obviously wrong the next. Although science may provide an intellectual bandage, it cannot provide the answers to what are ultimately hard social decisions.