IVF and Assisted Reproduction

A Global History

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IVF and Assisted Reproduction: Global Visions, Local Stories

In 1978, two children came into the world as a result of laboratory fertilisation techniques (*in vitro* fertilisation, or IVF). Louise Joy Brown was born in the UK on 25 July, and Kanupriya Agarwal, or 'Baby Durga', was born in India on 3 October.[1] In Oldham, near Manchester, Patrick Steptoe, an obstetrician and gynaecologist, and Robert Edwards, a reproductive physiologist, led the clinical and scientific work that facilitated Lesley and John Brown's attempt to have a child. Steptoe and Edwards achieved instant international fame; Jean Purdy, a nurse and scientist, is now acknowledged as having been a crucial member of the team.[2] In Kolkata, the key figure was Subhas Mukerji, a clinician, reproductive physiologist and endocrinologist. With colleagues Saroj Bhattacharya, an obstetrician and gynaecologist, Sunit Mukherjee, a cryobiologist, and two nurses unnamed in reports, he used laboratory and clinical techniques quite different from those of Steptoe, Edwards and Purdy.[3]

Remarkably, after decades of research and experimentation, two disparate sets of clinical and laboratory techniques in the UK and India succeeded within a few months of each other in producing a living child. In 'a race in two different corners of the world', the British team relied on Lesley Brown's natural ovulatory cycle, using just one egg for fertilisation;

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Mukerji's used fertility drugs to increase the number of ova available for fertilisation.[4] Where Patrick Steptoe used the surgical technique of laparoscopy to reach the sole egg, the Kolkata team used a transvaginal technique (colpotomy) to access multiple ova for laboratory fertilisation. The British team used a fresh embryo; Mukerji froze the embryos for fifty-three days prior to implanting three of them.[5] These two teams came in ahead of other scientist-clinician groups in the United States and Australia, who had also been trying for years to facilitate a human IVF birth.[6]

Reports of both births went rapidly around the world, giving rise to excitement, apprehension and even, to varying degrees, scepticism about the authenticity of the claims. Colleagues peppered Steptoe and Edwards with requests for more clinical details before they would credit them with having achieved an IVF birth, some still expressing doubt years after the fact.[7] Tragically, institutional scepticism led Subhas Mukerji to take his own life in 1981, after three years in which he had been unable to convince medical authorities of his claims, now vindicated, to have achieved IVF in India more or less concurrently with the British team.[8]

Today an estimated ten million people have been born following the use of IVF and assisted reproduction (AR).[9] More than forty years after the first two births, providers have built on, modified or set aside the original successful techniques, creating new kinds of assisted reproductive treatment for an expanded range of clinical indications and fertility goals. As at 2018, the International Federation of Fertility Societies (IFFS) estimated that AR was available in 132 countries.[10] In most countries with established programs, the proportion of AR births annually is around 1–4% of the total number of births.[11] In Israel and Japan, the figure is closer to 5%, while in Denmark reports suggest around 10% of births result from some form of assisted reproduction.[12] A significant proportion of AR offspring, perhaps as many as 50%, belong to sets of twins, triplets or even higher-order multiple births.[13]

An individual or a couple who want to obtain a child through AR can now create an embryo using either their own gametes (oocytes, ova or, colloquially, eggs, and sperm), or those of a donor provider, while clinics can source gametes and embryos from across the world.[14] Someone about to undergo a major medical treatment or a gender transition can have

gametes frozen in anticipation of later use, while women hoping to use their own eggs to become pregnant in the future can have oocytes removed, frozen and stored. Techniques of preimplantation genetic testing (PGT) of embryos extend AR to cases in which a potential child is at risk from a genetic or chromosomal defect.[15] If people who seek a child through AR are ineligible to use a technique for legal reasons, or, if they find their local clinics in some way unsuitable, they might travel across borders for treatment. Regulatory differences resulting from 'laws and religious bans [and] denial of treatment to certain categories of persons', in particular, have been a major reason for people to opt for reproductive travel; cost and quality factors, as well as a desire for privacy, are among the others.[16]

According to the European Society of Human Reproduction and Embryology (ESHRE), one in six male-female couples will 'experience some form of infertility problem at least once during their reproductive lifetime'.[17] Infertility can be the result of factors in the female, the male or both partners, while 10–20% of cases are unexplained, termed 'idiopathic infertility'.[18] These statistics relate to heterosexual couples, but infertility is now understood more broadly as the unmet desire to parent a child: sexual preference, marital status or an event such as early bereavement can lead people to seek AR. Several subcategories of infertility have at different times been identified, including primary infertility—the physical inability to establish a first clinical pregnancy—and secondary infertility, meaning the physical inability to establish a second or subsequent pregnancy.[19] Subfertility, meaning a 'reduced fertility with a prolonged time of unwanted non-conception', is now covered by the term 'infertility'.[20] 'Social infertility', arising principally from social factors, such as single status or a same-sex partnership, is a more contested but still widely used term.[21]

Assisted reproduction is expensive and 'more common in the rich world'.[22] Denmark, for example, uses AR at twenty-eight times the rate per million of population than does India.[23] The highest prevalence of infertility, however, is to be found in South Asia, sub-Saharan Africa, North Africa, the Middle East, Central and Eastern Europe, and Central Asia.[24] In a place such as the United States, with high availability of AR treatment, 'fertility financing' schemes exist for the many clients without

insurance support who are prepared to take out a debt to obtain treatment.[25]

A constellation of global fertility treatment 'hotspots' reflects regulatory diversity, geographical suitability and recognised expertise. At present, Belgium is the go-to nation for the increasingly sought-after procedure of intracytoplasmic sperm injection (ICSI), a technique that has outstripped the use of IVF, originally being used for cases of male infertility but now often used instead of IVF. Spain and Romania are major sites for egg provision, and Denmark for sperm.[26] The volatile surrogacy industry is constantly adapting to regulatory changes: India, Thailand, the United Arab Emirates (Dubai) and Mexico have been major fertility treatment destinations at different stages, but new laws have reduced treatment availability, notably for international visitors. In several well-publicised cases, women providing children through surrogacy, the children themselves and fertility clients have faced social dislocation when new laws have come into being.[27] As some markets have shut down, they have left a vacuum that other markets try to fill.

There are around 6000 AR clinics currently in operation worldwide. India has the largest number, with an estimated 1500, but China, with fewer officially registered clinics, may provide more treatments than any other country.[28] Israel has the highest number of clinics per head of population.[29] In Japan, where there are 574 clinics, subsidies to AR patients reflect government fears about a declining national birth rate.[30] High-end investment, high-tech products and international fertility companies are now standard for AR.[31] International investment advisors expect that the global fertility services market will grow beyond US$25 billion by 2026.[32] (Such market estimates may alter due to the impact of the COVID-19 pandemic, which was in its early months as this book went to press.) The global reproductive landscape, or 'reproscape', as it is sometimes called, is thus a very different place from the British and Indian 'cottage industries' of 1978.[33]

This book tells the story of how AR has linked together the worlds of human reproduction, medicine and politics.[34] As a synoptic contribution to what social scientists Sarah Franklin and Marcia Inhorn refer to as the 'new interdisciplinary field of reproductive studies', it explores the

multiple cultural components that go together to create the current global reproscape.[35] It builds on the work of numerous scholars, who have over decades painstakingly interpreted the significance of AR technologies for users, social groups and nations, and established the importance of media and the power of narrative in this history. Their work—in fields such as science and technology studies (STS), anthropology, literature, sociology, history, and studies of media, gender, sexuality and family—is now being enhanced by interdisciplinary collaborations with AR clinicians and scientists, and provides many of the interpretive models and much of the factual detail presented here.[36] Each country in which AR is practised would merit a full-length history and these national histories are now being written.[37]

Standard medical histories most often identify the discoveries and breakthroughs that led a field up to a certain point in history. Contrastingly, our focus is the social contexts of new developments, and the impact of AR on individuals, groups and nations.[38] The book's findings are based on a wide range of sources, including original interviews with key AR figures, archival materials, extensive mainstream media reportage and fertility blogs, as well as the relevant specialist literatures in medicine and science.[39]

Chapter Outline and Historical Overview

Chapter 2 shows how clinicians and scientists developed IVF for human reproduction in the lead-up to 1978. Chapter 3 examines the ways in which providers then worked to create the global phenomenon of AR today. Chapters 4 and 5 consider the regulatory restrictions that came into being starting in the 1980s and their effects on the international fertility trade, particularly the market for oocytes and surrogacy. Chapter 6 explores the implications of AR for people's experience of infertility, and the cultural issues that have arisen as new patient groups have sought fertility treatment. Chapter 7 outlines some of the new directions of AR technologies, showing where they are now and where they might be in

future, with a final reflection on the period from 1978 to 2020. What follows here is a brief overview of the history of AR.

Cooperation and exchange across medical and scientific disciplines were from the mid-twentieth century crucial to the research that led to the first IVF births. Specialists in clinical medicine, such as obstetrics and gynaecology, and the new field of endocrinology (the study of hormones) worked together with researchers in scientific fields such as embryology and cryobiology (the study of freezing of biological material). Breakthroughs were pivotal, but the role of the imagination, informed in part by science fiction, also played a part in the ways the science developed. Aldous Huxley's 1932 *Brave New World* startled millions of readers with nonchalant descriptions of babies hatched in factories, programmed to fulfil specific functions in a global totalitarian regime, all in a world where sex was divorced from reproduction. Yet some scientists and clinicians saw social value in aspects of reproductive engineering, as a means for 'the improvement of the human species, and finally the emancipation of mankind'.[40]

From the 1930s, on the clinical front, women undergoing surgical interventions, such as hysterectomy, as well as those experiencing difficulty having children, showed a willingness to provide reproductive material or undergo procedures to facilitate research. Often with no clinical benefit to themselves, they helped to build a knowledge base for IVF as a fertility treatment.[41] Making IVF possible was also contingent on propitious funding and regulatory environments. The initial funding for IVF was for projects focused on population control, a preoccupation of wealthy countries in the mid-twentieth century, which somewhat ironically yielded new knowledge for fertility research. A relatively unformed regulatory environment, ill-equipped to contemplate the specific issues posed by AR, proved to be another enabling factor. At every point, from the steps which led to the first creation of an embryo *in vitro* in 1969 to the first births in 1978, the creation of children through IVF and gaining recognition for doing so were never assured: they came about through a mix of intention and opportunity.

Beginning in the early 1980s, fertility treatment providers engaged in a process of expansion, to build on, accelerate and redirect existing treatments. They embedded a new industry within or alongside established

institutions: they set up new associations and journals and made crucial links with the pharmaceutical and medical devices industries. Successful clinicians and scientists provided training to international colleagues, in person and through textbooks, and new programs in hospitals and private clinics brought in established providers to teach them. In some cases, local initiatives came to reflect not just the goals of providers, but the reproductive agendas of nations.

Making AR possible in more places required new money. Funds came from sources such as private donors, clients, venture capital, and industry, as well as from public and private health insurance schemes. Assisted reproduction providers knew a positive public profile was essential. Without favourable reportage in the mainstream media, they faced an uphill battle to convince their colleagues, and religious and government authorities, of the value of their work. Mainstream media, including active public relations efforts by providers, celebrated milestones measured in years since 1978 or in numbers of live births, anticipated breakthroughs and highlighted increased success rates. Increasingly, fertility brokers such as surrogacy agencies mediated relationships between client and provider, even across national borders. In the 1990s, the internet began to turn most clinics into international providers, with their own online presence sitting alongside the emerging fertility blogs of their clients.

As the industry consolidated, a new politics emerged around AR, taking its cue in many instances from conservative religion, patients' and consumers' rights, and diverse strands of feminism. Assisted reproduction became the subject of laws and religious decrees, amid significant conflict about how and why, if at all, AR technologies should be regulated. New techniques focused the sights of theological activists on embryo research and a perceived threat AR might pose to the institutions of marriage and family; for its part, the AR industry sought the autonomy offered by peer regulation. Debates about these issues preoccupied legislatures from the 1970s and continue to the present day. Some AR clinicians and scientists voiced concern about medical risk to patients and future children, as well as warning of the risks to the reputation of medicine and the industry overall from over-commercialisation and unwarranted optimism about success rates. Now, discussions of medical and social risk are gaining in

prominence. Reducing the risk posed by multiple births to mother and child is a new focus of both medical and state regulation, while many fertility providers are paying greater attention to avoidance of ovarian hyperstimulation syndrome (OHSS), 'the most common complication related to ART', brought about by hormonal stimulation to increase egg numbers.[42] Success rates, too, have come under greater scrutiny. Regulators, along with many of the more reputation-minded clinicians, have tried repeatedly to enforce stricter criteria for claims of success, in the interests of transparency and patient welfare. And people born as a result of donor conception are actively seeking change to laws about access to donor identities.

The fertility globe now shifts constantly on its regulatory axis, as a consequence of new and changing laws. For example, state regulation of AR injected a new dynamic into the gamete and surrogacy markets. Today, local legal systems shape the options of clients, of fertility service providers and of people providing reproductive material or children through surrogacy. It is now possible to seek legal, cheaper, more private or more varied treatments beyond borders, and to compare options with the assistance of online consumer communities and fertility brokers. As Melinda Cooper and Catherine Waldby express it, the 'patchwork nature of national and provincial regulation creates distinctive geographies of permission and prohibition, so that intending parents may elude national regulatory restrictions and travel to a jurisdiction where oocyte or surrogacy markets are permitted'.[43] The story of global AR is for that reason not only one of expansion: it is also one of contraction and redirection, often with profound social consequences. The present reproductive bioeconomy, particularly in relation to international surrogacy and egg selling, has 'stratified' reproduction, making it possible to both 'generate and exploit global inequalities'.[44] Cross-border gamete selling, in particular oocyte sale, and surrogacy, for both providers and prospective parents, raises major concerns in relation to competing notions of 'rights' and 'choice', in feminist and legal analyses in particular.

Groups previously outside the reproductive world can now see themselves as having a right to pursue the same reproductive freedoms as others. Assisted reproduction has expanded former boundaries of family-building, for example, in provision of fertility treatment to

same-sex couples and single people. It has challenged conventional views of gender roles in reproduction, with increased recognition of male infertility and a concomitant rise in the use of ICSI. Women using AR beyond the former limits of reproductive age, and families seeking to use the gametes of deceased relatives to procreate, have tested prior assumptions about where the limits to human reproduction should lie. A recently revised industry glossary of infertility has extended its definition to include same-sex couples and single potential parents.[45] Providers disagree, however, on how far patients' wishes should be accommodated and, especially, on whether offering so-called add-ons, or adjuvant treatments, serves commercial gain more than medical need.[46]

Twenty-first-century AR is characterised by intensifying commercial alignments, continued laboratory and clinical research—including into controversial embryo 'gene editing'—as well as the development of cheaper techniques to expand AR into poorer countries and lower-income areas of affluent countries. As it has done since its early days, the future of AR relies on expansion and diversification at laboratory and geographical levels, and on the maintenance of a positive public profile.

Language, Narrative and Media

Now in its fifth decade, the practice of AR continues to revolve around what Aditya Bharadwaj refers to as the 'media/medicine' nexus.[47] Language, narrative and media create the way people see the reproductive world and their place in it, positive portrayals of AR positioning readers and listeners as having a stake in the success of research and treatment. The 'reproductive imaginary' takes its form through the use of particular words, metaphors and stories. Since the 1970s, many of these have become normalised through the mainstream media. Fertility news has virtually been a sub-genre of journalism, as reporters and editors have created a recognisable vocabulary through which consumers read, hear and make sense of their own experiences using the stories of others.[48]

Headlines about AR that refer to 'miracle' births or the invocation of the 'brave new world' are now so routine as to be shorthand for what to expect in a news story. The miracle birth will be one couple's quest for a

child through AR, often found in the 'women's' or lifestyle pages, while 'brave new world' implies a faceless big science, beyond the control of individuals, and potentially in the wrong hands. 'Brave new world' has been used at least 670 times in English-language print media reports using the term 'IVF'; 'playing God' features 757 times; 'designer babies' 7133 times.[49] Rather than taking seriously the standard tabloid provocation 'Are these people playing God?', the question might be better put this way: why does it make sense to talk about 'playing God'? Indeed: on what basis is the 'miracle' of assisted reproduction measurably more miraculous than that of natural birth?[50] A habit of characterising early AR providers as 'pioneers' similarly distracts from seeing them foremost as professionals—talented and dedicated ones, to be sure—pursuing their goals, going to work every day, adjusting and improving existing technologies. Seen in these ways, AR is actually part of a quite mundane history: a story of private and professional life from the late twentieth century.

Many of the debates that have emerged since 1978 have explicitly concerned the question of what word to use: does the fusion of an egg and sperm create an embryo? A fertilised egg? A pre-embryo? A 'pre-syngamy' embryo?[51] Such distinctions might seem arcane, but these questions were central to the anti-abortion-linked politics of early IVF. As specific terms gain traction as the natural way to speak, they authorise a specific understanding. Assisted reproduction has many definitions, but this book uses the wide ranging 'application of laboratory or clinical technology to gametes and/or embryos for the purposes of reproduction'.[52] The term 'IVF' is often used as a shorthand for several kinds of assisted reproduction, and it will sometimes be used that way here.

At times in the history of AR, hyperbole has made complex issues opaque, not least because some terms have become so conventional as to seem the natural way to speak of AR. The word 'revolutionary', for example, has been used so often to describe AR that even twenty years ago reports referred to the IVF technique as 'once-revolutionary'.[53] The 'revolution' can be inspected through an historical lens, to identify its component parts and to understand the individuals, professions, types of media, local cultures and institutions that led new fertility technologies to create a distinctive global marketplace. In what precise ways might IVF have

been revolutionary, and for whom? If we consider, for example, that many new technologies to some extent defy the 'laws of nature', air travel being the most obvious, perhaps the fact that one stage of human reproduction has been replicated outside the body might not be such a dramatic development.[54] For people who access AR, if the means seem revolutionary, the ends are likely to be the opposite, offering a stake in normality and a chance to blend in; to set the world to rights, not upend it. From the early 1980s, surveys in Australia, for example, showed that the public readily accepted IVF technology as a new way to create children.[55]

The Power of Analogy

History, both as it is made and as it is recounted, is among other things the search for new stories that accommodate innovation by making it recognisable according to older stories. As Marilyn Strathern has observed: 'There is no vacuum in people's practices and habits of thought; there are only existing practices and habits of thought on which the new will work'.[56] A crossroads between continuity and change is often marked by choices of analogy, and a struggle over analogies has been part of the politics of AR.[57] Were the changes that might come wholesale departures from precedent, or were they assimilated comfortably into reproductive traditions? Deciding one way or the other was paramount to the politics of early AR. As early as 1970, when Robert Edwards' Cambridge team had not long before succeeded in creating a human embryo *in vitro* for the first time, the medical journal *Lancet* sought to limit reaction to the news by claiming that the birth of children following IVF would be continuous with, not a departure from, any other kind of fertility treatment.[58] It argued:

> The treatment of infertility by in-vitro fertilisation of the ovum and implantation of the fertilised egg in the patient's uterus is not so new or so alarming a prospect as recent utterances and criticisms imply. … Surely this treatment would simply be an extension of earlier work in an area where other aids to conception have long been accepted but have not always been

> successful. Forebodings about 'test-tube babies' and 'genetic engineering' are unjustified.[59]

In this way, *Lancet* staked a claim for IVF as medicine as usual.

There are human consequences to the choice of analogy, and advocacy is built around such usages. Depicting surrogacy as directly analogous to a form of traditional baby-giving, found in some past and present societies and purportedly a norm from Old Testament times, has, for example, become a standard platform for advocates of commercial IVF surrogacy. In relation to the donation or selling of eggs, is the clinical procedure more closely analogous to the donation of blood, or of a kidney? The answer to such a question affects estimates of risk, and hence the parameters of regulation of gamete provision.[60] On donor conception, one AR practitioner has argued that programs providing eggs or sperm should be seen as the equivalent of casual sex, saying: 'Just as in the normal population a one-night stand ends up with a pregnancy. That child never finds their father. Donor children are not any different'.[61] In such a case, the choice of analogy has a human and personal significance. In all cases, analogy lays down the interpretive tracks along which the practices and assumptions of the future are reached.[62]

Rights and Needs

Assisted reproduction has also stretched the language of medical needs and rights. The asserted 'right' of the client seeking a child implies in turn a 'need' for the new fertility technology, sometimes in the face of a 'shortage' of provider eggs, sperm or surrogacy. These naturalised terms rely on an innovative mix of familiar rights arguments with the language of medical need, working to generate a rhetoric of urgency within a new supply-chain model of human reproduction. The recently gained right of some women to choose to have an abortion inadvertently paved the way for an argument for a right to 'access' the range of options available in AR.[63] The word 'access' itself implies a simple right to a social good, which can elide to suggest a right to obtain a child through access to another person's 'clinical labour', notably in the form of eggs or surrogacy.[64]

Words Unsaid

What is even sayable or unsayable also matters. In her 2006 book *The Baby Business*, political economist Debora Spar urged that the commercial realities of AR should be made explicit. She identifies the very intensity of feeling that surrounds reproduction and parenthood as the reason for a general unwillingness to speak of AR as a money-making enterprise. This hesitancy, she argues, has led to an unwillingness to regulate the business side of AR, exposing clients, as well as providers such as egg donors and surrogacy workers, to personal and legal risk.[65] A US television series titled 'How to Buy a Baby' relies on the same shock factor, speaking about AR in the language of commerce.[66] The idea of literally 'buying children' through surrogacy might seem offensive, for example, to people who see themselves as trying to make a family through now widely accepted commercial channels. 'Health service provision' is a more neutral term, while, at the other end of the spectrum, the legal offence of 'human trafficking' has been used in relation to surrogacy cases, and the activities of some fertility agents.[67]

As authors, academic commentators are not immune to scrutiny for our choice of words. In the social sciences and humanities, the ideal is that these choices are made with an awareness of their implications. A range of terms exist to describe reproductive travel, for example, such as 'cross-border reproductive tourism' and 'procreative tourism'.[68] The word 'tourism' seems unsuitable to describe journeys of such great emotional moment as those involved in making a child. 'Cross-border reproductive care', however, seems to over-accentuate the role of the providers. Using 'cross-border reproductive treatment' or 'travel' (CBRT) better captures the main activities involved, including the journey of the client to a reproductive service, or the journey of a provider of tissue or reproductive services.[69]

Men and women who provide sperm and oocytes for AR treatments are often referred to as 'donors'. Historically, there were reasons for this: medically facilitated sperm donation began without donors being paid, and one woman in an IVF program giving an egg to another was also referred to rightly as a donation. The widespread commercialisation of

these processes, however, means the term 'donor' can often be inaccurate, or can obscure the commercial basis of a transaction for legal reasons. 'Provider', the term used most often here, covers both donors and sellers, and takes into account the genuine human care that often goes into a decision to supply reproductive tissue or clinical labour, even for payment. In this light, is 'surrogate' (meaning substitute) really the right word for a woman providing so significant a service as the birth of a child for relinquishment? The term 'gestational carrier', currently used in the medical field to refer to a woman who provides a child following the use of another woman's egg, is an example of an alternative that recognises the work of pregnancy and labour, over the more problematic 'surrogate'.

Most would-be parents engage with the AR industry through an initial medical appointment, but the word 'patient' is not always the best way to describe them. 'Client' might be more accurate. It can cover both the clinical and contractual nature of many AR arrangements and leaves room for providers of biological labour, particularly in the form of eggs or children, to be referred to as patients. 'Candidate health care recipients' is a useful if cumbersome industry term for those seeking to obtain children via AR; 'IPs', for 'intended parents', is more widely used.[70] The terms used in this book are the outcome of a constant process of sorting by the present authors and others.

Assisted Reproduction: An Intimate Industry

In a 1980 essay in *Time* magazine, 'The Baby in the Factory', Roger Rosenblatt observed that an industry that helps to create human beings is unlike any other. He argued that 'technological parenthood may have the trappings of business, but it is not big business; it is the answer to someone's most personal prayers'.[71] In fact, AR is both: it is a set of global commercial ventures in which deep emotions and countless personal journeys are implicated, each one in a chain of multi-layered institutional, cultural and financial engagements. The term 'intimate industry' best sums up this aspect of AR.[72] A powerful engine of finance, politics and medicine surrounds the personal space of family-making, which is at the same time the emotional and the financial source of the energy that

drives a vast global market. Not only does the industry create the desired 'product'—a newborn human—it leads each client to their next life phase as a parent, or as childless.[73] As one fertility clinic expresses it, clients can make their transition there from 'patients to parents'; another encourages people to arrive as a couple and leave as a family.[74]

Who has a stake in the birth of a child through AR? At its starting point, AR is about what takes place between people seeking to have children and their clinical provider. Then the circles of investment in the birth of children widen: AR links the person or couple who wants the child, their extended family, friends or immediate community, religious groups or nations, with a major industry comprised of specialist clinicians and scientists, counsellors, fertility agencies who find gamete or surrogacy providers, along with manufacturers of pharmaceuticals and medical devices. Many people who are not actively involved in accessing or providing AR services are also part of the story, as venture capitalists, shareholders, taxpayers in public health systems, or as members of public and private medical insurance programs. Beyond them lie journalists, academics, students and consumers of media. With the growth of AR as a transnational industry, people accessing treatments are part of a global reproductive ecology, in which actions affecting their life experiences can occur far away from them. Understanding how such compelling global forces have intersected and helped to shape the experience of reproduction in the IVF era is the main goal of this book.

Notes

1. P. C. Steptoe and R. G. Edwards, 'Birth after the Reimplantation of a Human Embryo', *Lancet* 312, no. 8085 (1978): 336; AAP, 'Deep Freeze Key to Indian Miracle Birth', *Sydney Morning Herald*, 8 October, 1978.
2. Martin H. Johnson and Kay Elder, 'The Oldham Notebooks: An Analysis of the Development of IVF 1969–1978. V. The Role of Jean Purdy Reassessed', *Reproductive BioMedicine & Society Online* 1, no. 1 (2015): 46–57; Yvonne Collins, 'Plaque to Finally Honour Snubbed IVF Pioneers', *BioNews*, no. 1006, 15 July, 2019, https://www.bionews.org.uk/

3. T. C. Anand Kumar, 'Advent of Medically Assisted Reproductive Technologies (MART) in India', in *The Art and Science of Assisted Reproductive Techniques*, ed. Gautam N. Allahbadia and Rita Basuray Das (London: Taylor & Francis, 2004), 3–7, 5. See also Aditya Bharadwaj, 'The Indian IVF Saga: A Contested History', *Reproductive BioMedicine & Society Online* 2 (2016): 54–61. For what appear to be reasons of transliteration from Bengali, Mukerji is sometimes spelt Mukherjee, as well as in other ways. T. C. Anand Kumar, 'Architect of India's First Test Tube Baby: Dr. Subhas Mukerji, 16 January 1931 to 19 July 1981', *Current Science* 72, no. 7 (1997): 526–31; Sandra Bärnreuther, 'Innovations "Out of Place": Controversies over IVF Beginnings in India between 1978 and 2005', *Medical Anthropology* 35, no. 1 (2016): 73–89.
4. Ranjan Gupta, 'Jibes Put Test-Tube Baby Pioneer on Path to Suicide', *Sydney Morning Herald*, 26 June, 1981.
5. Steptoe and Edwards, 'Birth after the Reimplantation of a Human Embryo'; Anand Kumar, 'Architect', 527. See also K. S. Jayaraman, 'India Reveals Deep-Frozen Test-Tube Baby', *New Scientist* 80, no. 1125 (1978): 159. The terms 'implantation' and 'reimplantation' refer to the insertion of an embryo into the uterus of a woman having IVF. These are common terms that will, at times, be used here. Implantation is also, however, what occurs when an embryo attaches to the lining of the uterus, without IVF, so 'insertion' is a more apt word when referring to IVF.
6. One Australian clinic still advertises that it was responsible for the first IVF pregnancy (uncompleted), in 1973, https://monashivf.com/about-us/history/
7. According to Richard Marrs, an infertility specialist, 'Edwards and Steptoe would talk to nobody'. Jennie Smith, 'IVF Pioneers: Field Marked by Competition, Innovation', *Ob. Gyn. News* 51, no. 9 (1 September, 2016). See also Associated Press, 'Methods Called into Question: "Test-Tube Baby" Doctor Not to Get Award', *Globe and Mail* (Toronto), 31 October, 1978 and scepticism in 1980 expressed by the first Australian team to bring about an IVF birth there: 'How the Medical Team Succeeded', *Australian Women's Weekly*, 20 February 1980, 4–5.
8. Gupta, 'Jibes Put Test-Tube Baby Pioneer on Path to Suicide'.
9. Tim Lee, 'IVF Pioneer Alan Trounson's Work Started with Sheep Fertility, Helped Forge New Research into Stem Cells', ABC Landline, 15 February, 2020, https://www.abc.net.au/news/2020-02-14/landline

10. International Federation of Fertility Societies (IFFS), 'International Federation of Fertility Societies' (IFFS) Surveillance 2019: Global Trends in Reproductive Policy and Practice, 8th Edition', *Global Reproductive Health* 4, no, 1 (2019): e29, 2.
11. Bart C. Fauser and Robert G. Edwards, 'The Early Days of IVF', *Human Reproduction Update* 11, no.5 (2005): 437–38, 438; 'Fertility Blog: IVF by the Numbers', 14 March, 2018. https://www.pennmedicine.org/; Kate Aubusson, 'Australia's IVF Rates Revealed: One in Every 25 Births an IVF Baby', *Sydney Morning Herald*, 9 September, 2018, https://www.smh.com.au/
12. 'IVF Accounts for 5% of Babies Born in Japan in 2015: Survey', *Japan Times*, 12 September, 2017, https://www.japantimes.co.jp. Israel has the highest per capita use of any country and in 2013, its rate for IVF births was 4.3%. Daphna Birenbaum-Carmeli, 'Thirty-Five Years of Assisted Reproductive Technologies in Israel', *Reproductive BioMedicine & Society Online* 2 (2016): 16–23, 17 and Jerusalem Post Staff, 'Successful Fertility Treatments on the Rise in Israel—New Data', *Jerusalem Post*, 10 June, 2019, https://www.jpost.com/; Lucy Proctor, 'Why Is IVF So Popular in Denmark? The Changing Face of Procreation', BBC World Service, 21 September, 2018, https://www.bbc.com/news/world-europe-45512312. Comparative figures can sometimes require investigation. Denmark's figures might, for example, include sperm donation, or the figure for international users whose children do not show up in the population statistics.
13. Peter R. Brinsden, 'Thirty Years of IVF: The Legacy of Patrick Steptoe and Robert Edwards', *Human Fertility* 12, no. 3 (2009): 137–43, 141–42.
14. 'Oocyte' and 'egg' or 'ovum' are often used interchangeably in descriptions of the IVF process. The 2017 industry glossary uses 'oocyte' and 'egg' interchangeably, tending not to use 'ovum', which is the Latin for 'egg'. Fernando Zegers-Hochschild, G. David Adamson, Silke Dyer, Catherine Racowsky, Jacques de Mouzon, Rebecca Sokol, Laura Rienzi, Arne Sunde, Lone Schmidt, Ian D. Cooke, Joe Leigh Simpson, and Sheryl van der Poel, 'The International Glossary on Infertility and Fertility Care, 2017', *Human Reproduction* 32, no. 9 (2017): 1786–801. For a discussion of the IVF process, see Geoffrey Sher, 'Egg Maturation in IVF: How Egg "Immaturity," "Post-Maturity," and "Dysmaturity" Influence IVF Outcome', 10 April, 2017, https://drgeoffreysherivf.com. On gamete provision, see, e.g., World Egg Bank, http://www.theworl-

deggbank.com/; Mamamia Team, 'New Deal Will Allow Australians Using IVF to Import Eggs from America', 10 March, 2013, https://www.mamamia.com.au/; HunterIVF, 'Need a Sperm Donor?', https://www.hunterivf.com.au/; Victorian Assisted Reproductive Treatment Authority (VARTA), 'Guidelines for the Import and Export of Donated Gametes and Embryos Formed Using Donated Gametes', https://www.varta.org.au/resources/publications

15. 'PGT—Preimplantation Genetic Testing' and 'PGT-A—Preimplantation Genetic Testing for Aneuploidy Screening', https://monashivf.com. See also: 'Preimplantation Genetic Screening (PGS) and Preimplantation Genetic Diagnosis (PGD) Now Have New Names', 27 March 2018, Fertility Centers of New England, https://www.fertilitycenter.com
16. Marcia C. Inhorn and Pasquale Patrizio, 'The Global Landscape of Cross-Border Reproductive Care: Twenty Key Findings for the New Millennium', *Current Opinion in Obstetrics and Gynecology* 24, no. 3 (2012): 158–63, 161. See also Nicola J. Marks, Vera Mackie, and Sarah Ferber, 'Modes of Mobility: Tracing the Routes of Reproductive Travel in the Asia-Pacific Region', in *The Reproductive Industry: Intimate Experiences and Global Processes*, ed. Vera Mackie, Nicola J. Marks, and Sarah Ferber (Lanham, MD: Lexington, 2019), 145–74.
17. ESHRE, 'ART Fact Sheet' 2020, https://www.eshre.eu/Press-Room/Resources
18. '20–30% of infertility cases are explained by physiological causes in men, 20–35% by physiological causes in women, and 25–40% of cases are because of a problem in both partners'. ESHRE, 'ART Fact Sheet'. For an earlier, more detailed overview, see Jacky Boivin, Laura Bunting, John A. Collins, and Karl G. Nygren, 'International Estimates of Infertility Prevalence and Treatment-Seeking: Potential Need and Demand for Infertility Medical Care', *Human Reproduction* 22, no. 6 (2007): 1506–12.
19. Zegers-Hochschild et al., 'The International Glossary on Infertility and Fertility Care, 2017'.
20. C. Gnoth, E. Godehardt, P. Frank-Herrmann, K. Friol, Jürgen Tigges, and G. Freundl, 'Definition and Prevalence of Subfertility and Infertility', *Human Reproduction* 20, no. 5, (2005): 1144–47, 1144; Zegers-Hochschild et al., 'The International Glossary on Infertility and Fertility Care, 2017', 1800.

21. Anna Louie Sussman, 'The Case for Redefining Infertility', *New Yorker*, 18 June, 2019, https://www.newyorker.com. 'Involuntary childlessness' now includes the condition of 'a person with a child wish, who … has never been a legal or societally-recognized parent to a child' and also covers some of these social aspects of infertility. Zegers-Hochschild et al., 'The International Glossary on Infertility and Fertility Care, 2017', 1798; 1799.
22. 'IVF Rates and Safety around the World', *Economist* (London), 31 August, 2016, https://www.economist.com/
23. 'IVF Rates and Safety around the World'.
24. Maya N. Mascarenhas, Seth R. Flaxman, Ties Boerma, Sheryl Vanderpoel, and Gretchen A. Stevens, 'National, Regional, and Global Trends in Infertility Prevalence since 1990: A Systematic Analysis of 277 Health Surveys', *PLOS Medicine* 9, no. 12 (2012): e1001356.
25. Laura Briggs, *How All Politics Became Reproductive Politics: From Welfare Reform to Foreclosure to Trump*, Reproductive Justice: A New Vision for the 21st Century 2 (Oakland: University of California Press, 2018), 115; 'Infertility Financing Programs', resolve.org
26. Inhorn and Patrizio, 'Global Landscape', 160.
27. See Chap. 5.
28. IFFS, 'International Federation of Fertility Societies' Surveillance (IFFS) 2019', 8; ESHRE, 'ART Fact Sheet'. IFFS notes that both India and the People's Republic of China are difficult to document, in the absence of 'comprehensive registries and validation mechanisms'. IFFS, 'International Federation of Fertility Societies' Surveillance (IFFS) 2019', 4.
29. Birenbaum-Carmeli, 'Thirty-Five Years of Assisted Reproductive Technologies in Israel', 17.
30. IFFS, 'International Federation of Fertility Societies' Surveillance (IFFS) 2019', 7; 'IVF Accounts for 5% of Babies Born in Japan in 2015: Survey'.
31. Kate Hampshire and Bob Simpson have referred to the present time in the history of IVF as a 'third phase', characterised by 'an extension of access and availability that further integrates ARTs into infertility treatment across the globe [and] the move to recognise infertility as a disease (rather than mere misfortune) and to mobilise treatments to address it as such in developing world settings'. *Assisted Reproductive Technologies in the Third Phase: Global Encounters and Emerging Moral Worlds*, ed. Kate Hampshire and Bob Simpson (New York: Berghahn Books, 2015), 3.

Sarah Franklin sees the latest 'phase' as a time of increased acceptance of embryo research, without direct clinical use in reproduction. Sarah Franklin, Review of *Louise Brown: My Life as the World's First Test-Tube Baby*, by Louise Brown and Martin Powell, *Reproductive BioMedicine & Society Online* 3 (2016): 142–44, 142.

32. Allied Market Research, 'IVF Services Market to Garner $26.38 Billion by 2026 at 9.8% CAGR: AMR', 1 July 2019, https://www.globenewswire.com/news-release/2019/07/01/1876671/0/en/IVF-Services-Market-to-Garner-26-38-Billion-by-2026-at-9-8-CAGR-AMR.html
33. Inhorn and Shrivastav use 'reproscape' to refer to 'moving people, technologies, finance, media, ideas, and gametes, pursued by infertile couples in their "quests for conception."' Marcia C. Inhorn and Pankaj Shrivastav, 'Globalization and Reproductive Tourism in the United Arab Emirates', supplement, *Asia-Pacific Journal of Public Health* 22, no. 3 (2010): 68S–74S, 68S.
34. Several major studies have investigated the personal experience of fertility treatment. Sarah Franklin, *Embodied Progress: A Cultural Account of Assisted Reproduction*. (Abingdon, UK: Routledge, 1997). Individual memoirs and more recently online blogs tell of the emotional impact of the experience of trying to become a parent through AR. On memoirs, see Robyn Morris, 'IVF and the "Promise of Happiness"', in *The Reproductive Industry*, ed. Mackie, Marks, and Ferber, 97–107. Sarah Franklin provides details of overviews of feminist debates around IVF. Sarah Franklin, *Biological Relatives: IVF, Stem Cells, and the Future of Kinship* (Durham, NC: Duke University Press, 2013) 327, n3.
35. Sarah Franklin and Marcia C. Inhorn, 'Introduction' (Symposium: IVF—Global Histories), *Reproductive Biomedicine & Society Online* 2 (2016): 1–7.
36. Examples of collaborative work include: Martin H. Johnson, Sarah B. Franklin, Matthew Cottingham, and Nick Hopwood, 'Why the Medical Research Council Refused Robert Edwards and Patrick Steptoe Support for Research on Human Conception in 1971', *Human Reproduction* 25, no. 9 (2010): 2157–74 and Marcia C. Inhorn and Pasquale Patrizio, 'Infertility around the Globe: New Thinking on Gender, Reproductive Technologies and Global Movements in the 21st Century', *Human Reproduction Update* 21, no. 4, (2015): 411–26. Special issues of major journals have contributed to the ongoing conversation, such as Z. B. Gürtin and M. C. Inhorn, eds., 'Symposium: Cross-

Border Reproductive Care', *Reproductive BioMedicine Online* 23, no. 5 (2011) and Sarah Franklin and Marcia C. Inhorn, eds., 'Symposium: IVF—Global Histories', *Reproductive Biomedicine & Society Online* 2 (2016). On the research of the Feminist International Network of Resistance to Reproductive and Genetic Engineering (FINRRAGE), see Stevienna de Saille, *Knowledge as Resistance: The Feminist International Network of Resistance to Reproductive and Genetic Engineering* (London, Palgrave Macmillan 2017).

37. See Aditya Bharadwaj, *Conceptions: Infertility and Procreative Technologies in India*, (New York: Berghahn Books, 2016); Elizabeth F. S. Roberts, *God's Laboratory: Assisted Reproduction in the Andes* (Berkeley: University of California Press, 2012); Sandra P. González-Santos, *A Portrait of Assisted Reproduction in Mexico: Scientific, Political, and Cultural Interactions* (Cham: Palgrave Macmillan 2020); Margaret Marsh and Wanda Ronner, *The Pursuit of Parenthood: Reproductive Technology from Test-Tube Babies to Uterus Transplants* (Baltimore: Johns Hopkins University Press, 2019) and Robin Marantz Henig, *Pandora's Baby: How the First Test Tube Babies Sparked the Reproductive Revolution* (Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press, 2006). Major theses include: Christina Corinna Weis, 'Reproductive Migrations: Surrogacy Workers and Stratified Reproduction in St Petersburg' (PhD diss., De Montfort University, 2017); Ingvil Hellstrand, 'Passing as Human: Posthuman Worldings at Stake in Contemporary Science Fiction' (PhD diss., University of Stavanger, 2015); Jane Adams, 'Fertility Factors: Infertility, Medicine and the Law in New Zealand, 1950–2004' (PhD diss., University of Otago, 2017) and Burcu Mutlu, 'Transnational Biopolitics and Family-making in Secrecy: An Ethnography of Reproductive Travel from Turkey to Northern Cyprus' (PhD diss., Massachusetts Institute of Technology, 2019). Thematic studies include Michi Knecht, Stefan Beck, and Maren Klotz, *Reproductive Technologies as Global Form: Ethnographies of Knowledge, Practices, and Transnational Encounters*, Ethnographies of Knowledge, Practices, and Transnational Encounters 19 (Frankfurt: Campus Verlag, 2012); Ann V. Bell, *Misconception: Social Class and Infertility in America* (New Brunswick, NJ: Rutgers University Press, 2014) and Laura Mamo, *Queering Reproduction: Achieving Pregnancy in the Age of Technoscience* (Durham, NC: Duke University Press, 2007). Other major studies will be referred to in the relevant chapters.

38. Fittingly, the first such history was a memoir: Robert Edwards and Patrick Steptoe, *A Matter of Life: The Story of a Medical Breakthrough* (New York: William Morrow, 1980). Cambridge University Press published a commemorative volume on the fortieth anniversary of the first IVF births: Gabor Kovacs, Peter Brinsden, and Alan DeCherney, eds., In-Vitro *Fertilization: The Pioneers' History* (Cambridge, UK: Cambridge University Press, 2018). See also John Leeton, *Test Tube Revolution: The Early History of IVF* (Clayton, Vic.: Monash University Publishing, 2013); John Leeton, 'The Early History of IVF in Australia and Its Contribution to the World (1970–1990)', *Australian and New Zealand Journal of Obstetrics and Gynaecology* 44, no. 6 (2004): 495–501; Peter R. Brinsden, 'The Evolution of ART', in *Principles and Practice of Fertility Preservation*, ed. Jacques Donnez and S. Samuel Kim (Cambridge, UK: Cambridge University Press, 2011), 1–10; Jacques Cohen, 'A History of Clinical Embryology and Therapeutic IVF: From Pythagoras and Aristotle to Boveri and Edwards', in *Infertility: Diagnosis, Management and IVF*, ed. Anil K. Dubey (New Delhi: Jaypee Brothers Medical Publishers, 2012), 3–19; Martin H. Johnson, 'A Short History of *In Vitro* Fertilization (IVF)', *International Journal of Developmental Biology* 63 (2019): 83–92 and Joyce C. Harper, 'Background: Introduction to Preimplantation Genetic Diagnosis', in *Preimplantation Genetic Diagnosis: Second Edition*, ed. Joyce C. Harper (Cambridge, UK: Cambridge University Press, 2009), 1–10. Gayle Davis and Tracey Loughran have edited an important overview collection, *The Palgrave Handbook of Infertility in History: Approaches, Contexts and Perspectives* (London: Palgrave Macmillan, 2017).
39. Interviews were carried out in accordance with protocols approved by the University of Wollongong Human Research Ethics Committee (HREC), 10 February 2016 (approval HE16/028).
40. Franklin, *Biological Relatives*, 245, quoting Susan Merrill Squier, *Babies in Bottles: Twentieth-Century Visions of Reproductive Technology* (New Brunswick, NJ: Rutgers University Press, 1994), 73.
41. 'Biologist Miriam Menkin Recalls Pioneer Efforts', *Morning Call* (Allentown, PA), 30 July, 1978; Loretta McLaughlin, *The Pill, John Rock, and the Church: The Biography of a Revolution* (Boston: Little, Brown, 1982), 62–66. See Chap. 2 on the patients of Steptoe and Edwards.
42. ESHRE, 'ART Fact Sheet'.

43. Melinda Cooper and Catherine Waldby, *Clinical Labor: Tissue Donors and Research Subjects in the Global Bioeconomy*, Experimental Futures (Durham, NC: Duke University Press, 2014), 63.
44. Charlotte Faircloth and Zeynep B. Gürtin, 'Fertile Connections: Thinking across Assisted Reproductive Technologies and Parenting Culture Studies', *Sociology* (Oxford) 52, no. 5 (2018): 983–1000, 984. Shellee Colen coined the term 'stratified reproduction' in 1986, in a context not directly related to assisted reproduction. See Shellee Colen, '"Like a Mother to Them": Stratified Reproduction and West Indian Childcare Workers and Employers in New York', in *Conceiving the New World Order: The Global Politics of Reproduction*, ed. Faye D. Ginsburg and Rayna Rapp (Berkeley: University of California Press, 1995), 78–102.
45. Zegers-Hochschild et al., 'The International Glossary on Infertility and Fertility Care, 2017'.
46. Richard Kennedy, 'Back to Basics: Improve Access to Fertility Care by Subtracting the "Add-Ons"', *BioNews*, no. 942, 19 March, 2018, https://www.bionews.org.uk
47. Bharadwaj, 'The Indian IVF Saga', 55.
48. An important early work on the role of media is José Van Dyck, *Manufacturing Babies and Public Consent: Debating the New Reproductive Technologies* (Houndmills: Macmillan, 1995).
49. Authors' all-dates search of print media since the 1980s, using the Factiva search engine.
50. Sarah Franklin, 'Postmodern Procreation: A Cultural Account of Assisted Reproduction', in Ginsburg and Rapp, *Conceiving the New World Order*, 323–45, 332.
51. 'Syngamy' is the term used to describe the fusion of oocyte and sperm prior to the commencement of cell division in the early embryo. In Australia, the word came to betoken a time limit of around twenty-two hours, beyond which experimentation on embryos became, in the eyes of some, unacceptable. John Porter, 'Infertility Researchers Are Not Initiating Human Engineering', *Age* (Melbourne), 4 March, 1988.
52. Definition of assisted reproductive technology (ART), National Health and Medical Research Council (Australia), *Ethical Guidelines on the Use of Assisted Reproductive Technology in Clinical Practice and Research* (Canberra, National Health and Medical Research Council, 2017), 3. The Victorian Assisted Reproductive Treatment Authority (VARTA) has

an even broader definition: 'Assisted reproductive treatment (ART), also known as assisted reproductive technology, refers to treatments used to assist people in achieving a pregnancy. ART covers a wide spectrum of treatments'. VARTA, 'Types of Assisted Reproductive Treatment', https://www.varta.org.au. Assisted reproduction is also referred to as 'assisted conception'; ART can stand for assisted reproductive technology/technologies or treatment(s); MAR is medically assisted reproduction, and MART stands for medically assisted reproductive technology/technologies or treatment(s). Intrauterine insemination (IUI) of sperm took place clinically before the advent of IVF: today, IUI usually entails the use of fertility drugs, leading clinicians to argue for going direct to IVF, to control the number of embryos created. As with IVF, sperm are tested and prepared in the laboratory. Readers are referred to the 2017 industry glossary for the latest use of acronyms and definitions. Zegers-Hochschild et al., 'The International Glossary on Infertility and Fertility Care, 2017'.

53. People Staff, 'Miracle Babies', *People*, 12 October, 1998, https://people.com/archive
54. Franklin, *Biological Relatives,* 4–6.
55. Gabor T. Kovacs, Gary Morgan, Michele Levine, and Julian McCrann, 'The Australian Community Overwhelmingly Approves IVF to Treat Subfertility, With Increasing Support over Three Decades', *Australian and New Zealand Journal of Obstetrics and Gynaecology* 52, no. 3 (2012): 302–04.
56. Marilyn Strathern, 'Displacing Knowledge: Technology and the Consequences for Kinship', in Ginsburg and Rapp, *Conceiving the New World Order* 346–63, 348. Franklin builds on a similar point from Raymond Williams, *Biological Relatives*, 4.
57. Susan Merrill Squier addresses the importance of analogy extensively in the history of reproductive biology in *Babies in Bottles.*
58. Robert G. Edwards, Barry D. Bavister, and Patrick C. Steptoe, 'Early Stages of Fertilization *In Vitro* of Human Oocytes Matured *In Vitro*', *Nature* 221, no. 5181 (1969): 632–35.
59. 'Extracorporeal Fertilisation', *Lancet*, 7 March 1970, 510.
60. Naomi Pfeffer, 'Eggs-Ploiting Women: A Critical Feminist Analysis of the Different Principles in Transplant and Fertility Tourism', *Reproductive BioMedicine Online* 23 (2011): 634–41.