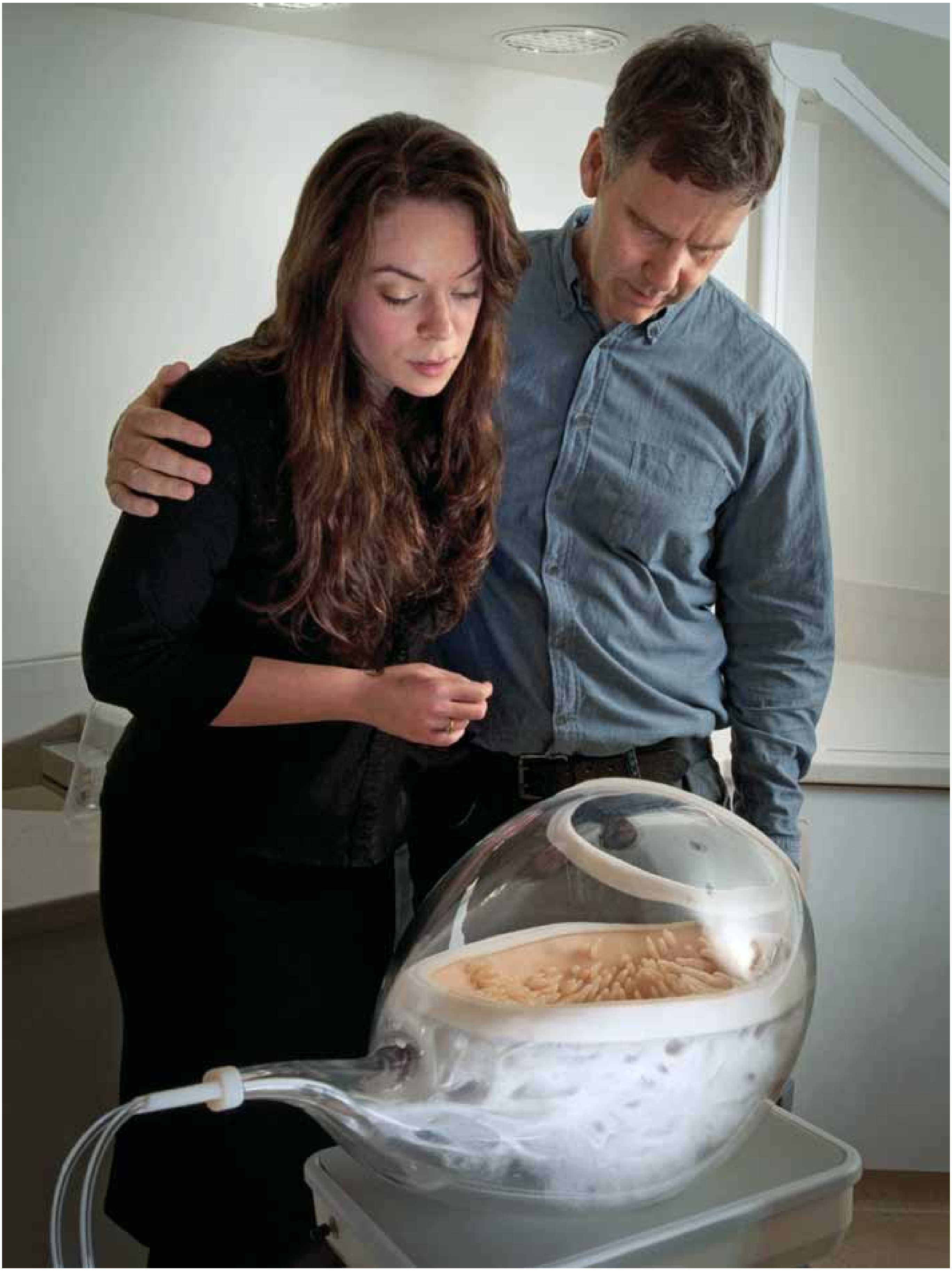

Antithesis

virgin births

In this extract from her book *Like a Virgin: How Science is Redesigning the Rules of Sex* AARATHI PRASAD explores the issues of surrogacy and the possibilities artificial wombs open up for prospective parents.

In 1924, evolutionary biologist JBS Haldane coined the term *ectogenesis* to describe how pregnancy in humans could be provided through an artificial womb. In a fictional account, he had two future scientists describe the birth of the world's first ectogenic child. "Now that the technique is fully developed, we can take an ovary from a woman, and keep it growing in a suitable fluid for as long as twenty years," one of the characters announced. This, by the character's calculations, would result in "a fresh ovum each month, of which 90 percent can be fertilized, and the embryos grown successfully for nine months", at which point they could be "brought out into the air". Haldane imagined that artificial wombs might become so popular by 2074 that only a small minority, "less than 30 percent of children", would then "be born of woman".

With 62 years to go until Haldane's sci-fi scenario, many researchers in the field are now confident that, despite the inherent complications and difficulties, the technological perfection of an artificial womb is actually achievable. The French biologist Henri Atlan predicts that, within a hundred years, science will master the complete development of the human foetus from conception. In the meantime, Carlo Bulletti, a professor of reproductive biotechnology at the University of Bologna, says that *partial ectogenesis*—growing foetuses between 14 and 35 weeks of pregnancy—is already within our reach if we were to use all of the knowledge and technology at our disposal.

←↑ A synthetic tissue incubator by the artist Veronica Ranner in her exhibit *Biophilia*. *Veronica Ranner*

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An artificial womb that can sustain and continue the development of extremely young foetuses could completely reinvent the parameters of neonatal medicine, but regardless of such gains, a fully functional artificial womb will also present entirely new ethical dilemmas, including some we may not be ready to negotiate.

What if a foetus that would otherwise have been aborted could be removed from its mother's body and gestated artificially? Would that improve the chances of adoption for a child, given that many couples prefer to adopt a baby rather than an older child? Would aborted pregnancies be viewed as a prospective joyful miracle in the tradition of the first test-tube babies, or would they be seen as supplanting the placement of older children needing a home?

How will this new technology alter the identity of a mother, a role that would cease to trigger a biological bond, even if her own egg is used? For instance, there has been a great deal of research into the hormones oxytocin and arginine vasopressin. In mammals, the levels of these hormones are elevated in mothers' brains. Oxytocin levels also increase during labour and reach a peak at the time of delivery. Both oxytocin and vasopressin have been linked to the instinct towards maternal care and mother-child and other affectionate, family bonding. The hormones have even been seen to rise when mothers engage in other supportive and bonding behaviours, long after pregnancy, though it is not known how and why this occurs. If a mother did not experience the increase in hormones related to pregnancy, would it make a difference later in life? Would it be possible to give a mother a dose of the hormones, in place of this natural release? It is apparent, from the experiences of many adoptive mothers, that a mother-child bond forms even in the absence of pregnancy, but it may be that those who choose to adopt happen also to have a strong instinct for maternal care.

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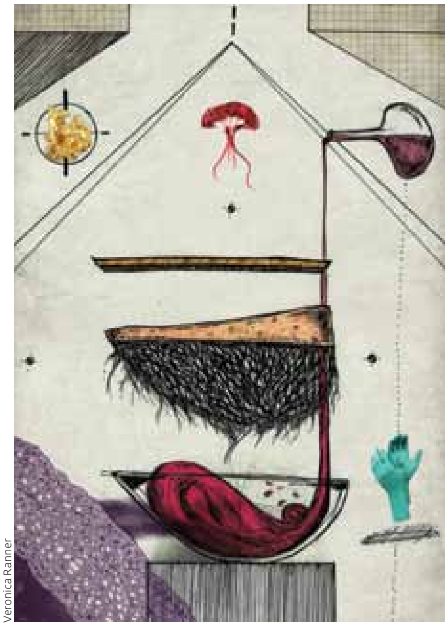
Further, since a child's identity is in part shaped by the communication of hormones and other information from mother to foetus, pregnancy via an artificial womb would redefine what it means to be a biological parent. Perhaps in the future a mother who uses an artificial womb will primarily be seen as a *genetic* and *social* parent, since all of the biological exchanges of pregnancy will gain new significance. Could the artificial womb become yet another symbol of the ways in which a woman is or is not a 'good mother'? By relinquishing the chance to shape her child's development from embryo to full term, a mother might be ensuring a more resilient temperament for her offspring, after all. In a case where a woman uses a donor egg and an artificial womb (by choice or necessity), the baby will have neither gestated with the mother nor bear any of her genes. Would the egg donor have more legal rights to the child in this case? In these ways, the very concept of an artificial womb reveals how societies view women. Even in the twenty-first century, a woman is still often defined by her role in procreation.

Consider, for instance, surrogacy, the practice of using another person's womb to carry your embryo to term. The role of surrogate mother, sometimes described as putting up a 'womb for rent', is considered by some to be exploitation, especially as the practice has been more and more often outsourced to countries where a high proportion of the population live in poverty—such as India.

Since 2002, when the Indian government legalized paid surrogate pregnancy—critics say they did so in the hopes of giving birth to a new 'pink-collar' industry—young Indian women have been queuing up to become surrogate mothers. There are doctors in nearly every major Indian city working with women who want to be surrogates; there is even a town in the state of Gujarat, Anand, that is poised to claim the mantle of the nation's go-to centre for paid pregnancy. In 2009, one Mumbai doctor told the London *Evening Standard* newspaper that she delivers more than 15 babies for British couples every month—about one every 48 hours. (Unfortunately, despite the legalization of the service, the government does not keep reliable numbers of how many women have become surrogates.)



Veronica Ranner

↑ The original sketch of a potential tissue device in Veronica Ranner's *Biophilia* installation.

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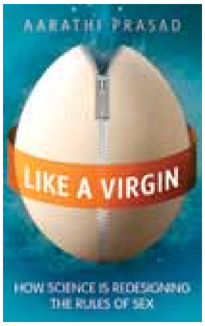
It's not surprising that Indian women are signing up in hordes—they are paid between $6000 and $10,000 to be a surrogate, which amounts to about 15 years' wages, on average. The rise in infertility in industrial nations is certainly fuelling this 'business', as commercial surrogacy is banned in most of Europe and in many US states. Couples, most commonly from the UK, US, Germany, Taiwan, Japan and Australia, go to India to take advantage of these services, because, even with the travel costs, it will cost them just one-third of what it would in their home countries.

There are complications to this outsourced labour. Though fertility clinics in India are state-of-the-art, in general, women in India are 69 times as likely to die from childbirth-related issues due to inadequate access to good medical facilities. The Indian government has not put in place any regulations to protect the rights of surrogate mothers. As it stands, surrogate mothers are looked after during their pregnancies, but they receive no compensation for medical difficulties that arise after childbirth. These women are at risk of long-term liver problems—a side effect of being pumped full of the hormones used to prepare the body for pregnancy. They also may face the common complications of pregnancy: the risks of toxaemia, anaesthesia and haemorrhage, to name but a few. Further, it has been documented that many couples who have returned from using surrogate services in India have delivered twins. Multiple births generally mean lower birth weights for the babies and more dangers that arise to the mother during childbirth—so much so that implantation of more than one embryo during IVF is frowned upon by the UK's National Health Service.

Plus, we just do not know what the true risks of carrying a child to term who has no genetic relation to you are. We do know that a mother who has been exposed to a partner's sperm before she conceives his child is less likely to suffer from pre-eclampsia, a potentially life-threatening condition in which blood pressure and urine protein levels soar. Preeclampsia may be related to immune recognition, that is, when the mother's immune system antibodies, after being exposed to the father's foreign antigens, allow the placenta to penetrate the wall of her uterus more deeply. Researchers have found that the many genes that control the growth of the placenta are expressed from only the father's DNA. This could mean that the growth of an embryo and its supporting placenta in the body of a woman who has never been exposed to the genetic father's antigens, *and* who herself has given no genetic input into that embryo, may be up against an as-yet-uncatalogued threat to her immune system—as well as that of the foetus she is carrying.

There are also looming issues unrelated to health. In one recent case, a Japanese couple who had paid an Indian surrogate ended up divorcing, and the ex-wife no longer wanted the baby—who had not yet been born. The surrogate mother didn't want the baby either, and under Indian law, she was prevented from handing over the child to the father. After much legal wrangling, the paternal grandmother was given custody of the infant.



Surrogacy in India is a lucrative business, and family hierarchies in the country still hold great power—especially over their female members—which raises the question of whether all of the women caught up in the system are truly doing so out of choice. Could some families be putting pressure on their young women to join the ranks of surrogate mothers in order to benefit household economics? One family, for instance, was recorded to have three sisters pregnant as surrogates at the same time; their sister-in-law was pregnant with her second surrogate child as well. Likewise, many surrogate mothers live in houses that have been described as akin to a fertility reality show. For the duration of their pregnancy, up to 15 expectant mothers may be packed into a house, where they are overseen, Big Brother-style, by a former surrogate mother.

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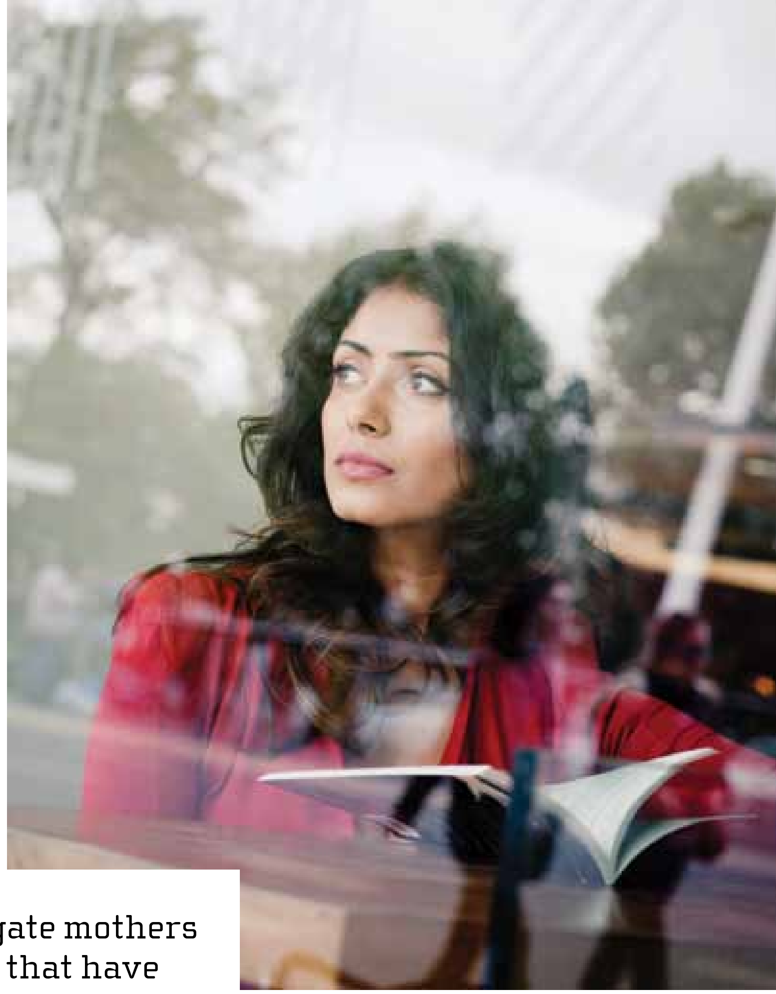
A doctor who implants embryos in surrogate mothers at a prominent Mumbai clinic reported to the London *Evening Standard* that business is very fertile indeed. "Surrogacy is spreading at a very fast pace here and there have been very few complaints," he said. "Our email inquiry box is full of messages from people from all over the West." Another fertility specialist at the clinic emphasizes the convenience in his pitch: "There is no paperwork involved; the couples don't have to go through any lawyers; it's a clean issue—and there is no litigation." While such loopholes may be attractive to the doctors' relatively wealthy clients, the Women's Protection League of India disagrees that surrogacy is a positive development for the surrogates themselves, especially with respect to their health. A spokesperson for the group said, in no uncertain terms, "This is exploitation and I totally condemn surrogacy."

An artificial womb could be the great equalizer for women—a way to end the exploitation of another woman's body in order to bear a child when one woman discovers that her own body cannot do so for her, or even if she decides that it's simply not convenient to do so. It would mean that a woman's big life choice would be *whether* she will bear her child, rather than *when* she might do it. And as such, this mother could carry on with her life as usual up until the moment of birth, much as most fathers do.


↑ Aarathi Prasad, author of *Like a Virgin*. Wang Wei

The cultural divide between mothers and fathers appears to be closing, at least in some parts of the world. Two generations ago, fathers were not as hands-on and engaged with child-rearing as they are today, in the Western world, at least. There hasn't been a change in the biology of sex in that time; the change has come through our culture, including the tools available to us to equalize the distribution of labour (in the sense of work). When an artificial womb becomes available, an equal distribution of labour (in the sense of childbirth) will finally be within reach. This will mean that women will be freed from the dangers of pregnancy and will be able to work productively throughout gestation; it will also give men an essential tool towards being able to have a child entirely without a woman, should they choose. But it also means we will have to consider the most basic questions of gender: why are the roles of mother and father still seen as different to most people on the planet? Why can't a man be a 'mother'? Why do we care so much about what it means to be a 'mother' rather than to be a 'parent'? ⌘