

I THE VISIBILITY OF THE GENETIC FUTURE

THEME 1 To a much greater degree than generally realized, the often sensational achievements in the life sciences stand in continuity and commonality with old practices tested in social living. What is playing out today in the focus of public controversies has been previously thought through, dreamed of in myths, or prefigured in the joint history of the domestication of plants and animals. But discontinuities in the life sciences put pressure on longstanding social arrangements. A defining feature of the molecular life sciences—equally as important as (if not more important than) their well-recognized ability to reshape organisms and bodies—is that they make things visible that could not previously be seen. Extracted from their original contexts (and placed into new ones), these things tend to acquire, precisely through their newly found visibility, an essential status of their own. They are thus—falsely—seen as agents that can act on their own. This thesis is elucidated in examples from two areas in which the newly achieved visibility and mobility play large roles and in which the tension between continuity and discontinuity becomes salient—assisted reproduction technologies (ART) and the striving to enhance achievement with its controversial but trailblazing potential.

MAKING THINGS VISIBLE

With the slogan “Sense and Simplicity,” the Philips company’s global advertising campaign promotes a number of devices intended to simplify daily life. A clever design shows a minimalist white box with the simple label: “Technology should be as simple as the box it comes in.” This creates the impression that a device finally fulfills the dream of immediate access. Among Philips’s new gadgets is a three-dimensional ultrasound scanner for prenatal diagnosis. In the advertisement, first the viewer sees the conventional two-dimensional image of a fetus. A landscape in shades of gray is shown; only the trained eye of a gynecologist can make out its relevant contours. The translation follows in the second image. The relevant contours are marked with a continuous white line running through the gray landscape. Now the shape of a thumb-sucking fetus is recognizable. The picture thus corresponds with what ought to become visible in a routine obstetrics exam: the physician explains to the excited parents the shape of the fetus, which is initially visible on the monitor as a moving, gray pattern. Then the third image delivers the advertisement’s promise—simplicity. This is the 3D ultrasound scan that uses an algorithm to transform the meaningless segments of the gray surfaces into the familiar 3D image of a baby sucking its thumb. The image “speaks” for itself; the baby’s head is now recognizable even for laypeople.

Philips’s advertising specialists probably were not thinking of Diderot when they explained their product’s attractiveness by its ability to make things visible. Diderot’s *D’Alembert’s Dream* (1769) records a conversation between Diderot and his friend D’Alembert about matter and the characteristics of living things. The author demonstrates his viewpoint in an initially

paradoxical-seeming comparison between a piano endowed with sentience and memory and the development of the egg:

Do you see this egg? With this you can topple every theological theory, every church or temple in the world. What is it, this egg, before the seed is introduced into it? An insentient mass. And after the seed has been introduced into it? What is it then? An insentient mass. For what is the seed itself other than a crude and inanimate fluid? How is this mass to make a transition to a different structure, to sentience, to life? Through heat. And what will produce that heat in it? Motion . . .¹

The point here is not to revive the debate between vitalism and materialism but merely to note that, at the conclusion of the debate, Diderot considers it enough to show things as they are. For him, seeing an egg as such disproves all schools of theology and all the temples in the world.

Two and a half centuries later, our abilities to visualize things have increased. We no longer see merely an egg but also see what goes on inside it. In addition to the microscope, a number of other instruments analytically separate and make visible the building blocks of an egg and other components of biological matter—genes, proteins, and intracellular membranes and compartments. Life is subdivided into its organizational units. Our molecular gaze makes this fragmentation possible. And this step seems to follow logically from the dissection of corpses in the Renaissance, with genome browsers replacing anatomical theaters as if to show that only the depth and resolution of our gaze have changed. Today our gaze pierces genes instead of organs.

But if our view today has grown sharper and deeper, why don't things and their contexts become simpler? If observing an egg in its motion and warmth is enough to topple every theologian on earth, why has seeing the molecular mechanisms that

underlie that motion and warmth led to such heated controversies over the life sciences? Far from being disproved, the schools of theology and the temples associated with them have themselves adopted the molecular glance. They too interpret and evaluate the elementary building blocks of the molecular age. In public discourse, they have become powerful stakeholders that codetermine what should happen with the molecules that determine the organic whole. Secular ideas of morality are also shaken by what the molecular glance reveals. Classical secular tropes—human rights, human dignity, human equality—are now projected in an unforeseen way onto the fragments of life that have now become visible. As Alex Mauron rightly notes: “The genome has become the secular equivalent of the soul.”² So what is wrong with the molecular visibility of life, which has become such a prominent characteristic of our time? Where does the alarm come from?

WHAT EFFECT DOES LIFE'S NEW VISIBILITY HAVE?

The molecular view does not simplify things but complicates them and leads to controversies because it enables interventions in life on a scale that did not exist in the past. What the external view of an egg enables people to do with it is very limited. By contrast, revealing its internal functioning uncovers almost endless possibilities for manipulating its functions and putting them together in a new architecture of life. It is no coincidence that cloning—the somatic transfer of cell nuclei—has become the icon of the potential to alter life. Replacing the cell nucleus with the genome taken from another cell of the same or a different species is a vivid illustration of what the molecular glance can do with the knowledge and technology it comprises. It also shows that the familiar distinctions—between knowledge and application,

between science and technology—are outdated. Under the hegemony of the molecular glance, knowledge has become action. Today the fact is that *understanding life means changing life*.

The molecular life sciences' glance from within has replaced the external view—the famous “view from nowhere.”³ The latter postulated the ideal of nature as an object existing “out there” as a collection of truths to which science needed only hold up its innocent mirror. It was possible in Diderot's lifetime to see an egg without doing anything with it, but this strict separation has as good as vanished today. The anthropologist Paul Rabinow comments on the sequencing of the human genome:

The object to be known—the human genome—will be known in such a way that it can be changed. This dimension is thoroughly modern; one could even say that it instantiates the definition of modern rationality. Representing and intervening, knowledge and power, understanding and reform, are built in, from the start, as simultaneous goals and means.⁴

All projects that seek to understand life aim at changing it, which is hardly astonishing considering the rationality that drives these developments. For example, the examination of the earliest phases of embryonic development can be carried out only by means of the same laboratory protocols and instruments that enable the later modification of these very phases. What sounds like an epistemic tautology is in reality the engine of scientific-technological development.

In the face of this fact, it is no wonder that the molecular glance has drawn the attention of theologians and their temples, whether religious or secular. The project of the Enlightenment planned to let nature finally speak for itself and to register its voice encyclopedically. It was based on an unspoken assumption about the moral authority of nature, an assumption found in

various forms and nuances in many cultures. Diderot's claim was implicitly based on the idea that, by viewing nature, we could unconsciously derive norms for dealing with it. The sight of the egg (the question of *what is*) was to ground the normative discourse about values and meaning, translated one to one into the established territory of temples and theologians (the question of *what ought to be done*). But if what is "given by nature" becomes predicated on the gaze of molecular biology with the options for intervention it implies, then what is natural is from then on subject to the contingency of such interventions. *What is* multiplies into numerous options of *what ought to be* (or could be). In this sense, on the molecular level what is natural is becoming a substantially political issue.

But are we really in the process of crossing an anthropological threshold that we should approach only with the greatest caution, if at all? Do we really stand on the brink of an epochal rupture in the history of humankind, a point of no return? The entry into the molecular age, which like all periodizations can never be exactly pinned down, in no way extinguishes all previous ages. On the contrary, the new enters into new configurations with the old. The feeling of standing on the threshold of a new age is initially nothing more than that—a feeling, an inkling of the change that often begins when new concepts are introduced or new phenomena are first recognized (and named) as such. If the viewpoint and the scientific understanding of what a gene and what genomics are have dramatically changed in the last few years, then perhaps it is not surprising that these new interpretations have not yet percolated into public understanding. But vice versa, anchored in everyday knowledge and experience are practices (and the memory of them) that can ease the identification of connections and continuities between the old

and the new. We interpret also in everyday life, and there too the interpretations of the forms of life and of living together are constantly changing.

AN INTERRUPTED CONTINUITY: ASSISTED REPRODUCTION

Assisted reproduction is the area of biomedicine in which the latter's potential was first actualized, and to a degree it reveals what will be possible in the future. A rough overview of the last three decades in the history of assisted reproductive technologies (ART) creates the impression that the expansion of the possibilities to conceive children has in fact led to a conspicuous discontinuity in the reproduction of life. Women after menopause, same-sex couples, single people (usually women), and even the deceased (only men so far) are examples of individuals or categories of people for whom the conception of offspring was simply out of the question before the availability of ART. The most conspicuous and far-reaching effect of this discontinuity is the desynchronization of the structuring of kinship and family relations, which is accompanied by a redistribution of the parental roles and their modalities. In the words of Marilyn Strathern, relatives are always a surprise.⁵ This is all the truer when ART plays a role.

Yet what aspect of the desynchronization of the conventional family can really be traced to ART? Isn't this desynchronization due more to the unparalleled extension of human life expectancy and other improvements in living conditions, so that people have more time and opportunity to found patchwork families in various phases of life? This is not entirely true because ART undeniably entails various degrees and forms of desynchronization, some of which are inconceivable in the context of natural

reproduction. The legal challenge won by Diane Blood marks a case in point. She had sperm taken from her comatose husband before his death, used it to carry out in vitro fertilization (IVF), and demanded from the British courts permission to implant the embryo. In 1998, this act seemed the most extreme example of an ART-induced desynchronization of a genealogical relationship. What could be more asynchronous than procreating new life after one's own death? We return to this case later. Here it suffices to note that the court decision established posthumous fatherhood as a legitimate family relationship and thereby granted every man (in Britain) the right to decide during his life whether he would like to procreate offspring after his death by means of ART.

Ten years later, most people regard cloning as a much more extreme scenario than IVF is. Many of the objections to the further development of reproductive cloning have to do with the suspected changes that such a practice would bring about in the genealogy that we are accustomed to—grandparents, parents, children. One frequently cited argument is that a clone would be the child and simultaneously the genetic twin of his cloned parent and thus the genetic child of its grandparents. Wouldn't this be an even less endurable degree of desynchronized confusion than what ART already causes today? It is not our aim here to provide another contribution to the monumental debate on the morality of human reproductive cloning. We are interested, instead, in the question of why cloning is perceived as such a radical challenge to our reproductive habits. In other words, how did clones become twins?

HOW CLONES BECAME TWINS

When the news of the cloned sheep Dolly went around the world in 1997, a Swedish government minister called his science

adviser to vent his outrage and to demand an immediate ban on human cloning. The adviser asked him whether he had ever encountered cloned people, which the minister emphatically denied. Only after the adviser explained that monozygotic twins are “clones” did the minister calm down and stop demanding a new law.⁶ There are important things in common between clones and twins, of course, but there are also differences. Clones would not fulfill three of the criteria defining twins—simultaneous conception, common prenatal environment, and the circumstance of being born together. Thus, clones cannot be twins.

A similar agitation rules the public discourse. It too is permeated by a diffuse form of genetic essentialism that sees in the genome the secular equivalent of the “soul.” Scott Gilbert, one of the fathers of developmental biology, half-jokingly suggested that when meeting a stranger we could from now on take out of our pocket a CD with our genome on it instead of a visiting card. If we take seriously this conflation of genomic and personal identity, then it seems disturbing that someone else should share our same genome. But if we recall our common experience with twins, then we see two (or more) people who came into the world in the same birth process, quite apart from whether they resemble each other. In many languages, the word used for twins means nothing more than that they were born by the same mother at the same time. Indeed, another adjective, monozygotic or dizygotic, is needed to clarify whether these two people share not only their mother but also the same genome. Today we also know that dizygotic twins and about a third of all monozygotic twins do not share the placenta and the chorion in the womb and thus develop in different hormonal and endocrinological uterine environments, which may influence their later lives.

But the argument (which has become a commonplace) that a clone is merely a delayed twin shows a deeper-seated, substantial

shift in our stance toward human experience—that we attribute much more importance to the supposed genetic essence than to the context in which this genetic essence develops. Incidentally, a clone would also differ genetically from its parent anyway because the clone's mitochondrial DNA comes from the egg cell of the donor (and experiments with mice have shown that mitochondrial DNA can have effects even on cognitive abilities). On top of that, the clone would in any case develop within a completely different intrauterine environment and thus encounter a host of different causal factors that mold the genotype into phenotype during embryogenesis. And it goes without saying that the environment after birth would also be different—different parents, different relationships, and a different point in time. A clone can be regarded as a twin of its parent (with whom it does not share any of its temporal experiences—the sharing of which has defined twins throughout human history) only in one sense—*that of the genome*.

Significantly enough, empirical surveys with twins have shown that they do not trace, much less reduce, their similarity and their close relationship with each other to their identical genome. Even less do they see their identity as being endangered by the fact of sharing the same genome. On the contrary, they have a positive attitude toward being an identical twin and, incidentally, have much less fear of human cloning than the average person does.⁷

THE GENETICIZATION OF CONCEPTION⁸

The most common example of ART is the donation of gametes (sperm and eggs, the haploid reproductive cells), which creates a triangular (or quadrangular) relationship between an infertile

couple and one (or two) gamete donors. This practice is still forbidden in some countries, even in the Western world. The most conspicuous example of altered role distribution in reproduction is surrogate motherhood, which the opponents of ART often attack as the epitome of reproductive chaos. But a closer look at parenting practices that have existed throughout history casts a different light on this. In fact, even if surrogate motherhood cannot be compared, for example, to the function that a wet nurse had in many societies, the latter practice does show that the transfer of the mother-child relationship to another woman was definitely not regarded as an attack on the family. The upbringing and education of the children, too, were carried out not only by the biological parents but also by a number of other persons whose influence on the future development of the child was probably at least as great as that of his or her intrauterine environment and hence of today's surrogate mother.

Additionally, all earlier societies dealt with children who were not biological offspring. Social arrangements like adoption, which existed in all cultures, testify to the ability to capture the nuances of parenthood in a legal construction that synthesizes the manifold influences on a child's life. Children born to unmarried parents might have grown up with relatives or strangers. The split between genetic and social parenthood that is often lamented as characterizing ART has thus always existed in history—all the more so since those were times of extended families, high rates of child mortality and of death in childbirth, widespread patriarchy, worries about family honor, and obsessive regulations of succession, whose economic value could be passed down only within certain family lines.

Indeed, what we refer to as *inheritance* and what is now virtually synonymous with *genetic inheritance* used to entail a rather

loose, imprecise, and changing set of influences. Gods, weather conditions, the mother's dreams at the time of conception, and several other factors were mobilized to explain the newborn's appearance and characteristics, which today we call the *phenotype*. Reproduction was perceived in a deep sense as a complex, unforeseeable process that always involved more than the two parents alone.

From the standpoint of the history of science, the term *inheritance* was imported from the legal system into biology in the seventeenth century.⁹ Today, more than fifty years after the discovery of the double helix, it appears as if the identification of the genetic basis of inheritance has separated this—necessary—component of the process from the equally necessary others. And this is one of many examples of a more general trend that is explored in this book. The social context is split off from the genetic core. Indeed, the power to shape the social context in the first place is attributed to the genes, as well.

Our hypothesis is that the more we know and learn about our own biology, the less we are able to fit this knowledge into a coherent whole. The problem does not lie in the incompleteness of our knowledge; incompleteness is a constant. Rather, in the process of the molecular reduction of our functioning as persons, the knowledge thereby gained takes on an increasingly essentialist form. The isolation and extraction of “epistemic things”¹⁰ from their context is a necessary precondition for being able to visualize, examine, and manipulate them. What is thereby lost and made invisible is the context, including the societal context, in which they function. In this sense, we assert the somewhat heretical claim that, even if they are not scientifically tenable from today's viewpoint, earlier interpretations of reproduction were

better able to grasp the continuum of events that shaped its outcome and to connect the various factors with each other. None of them was given unambiguous primacy. There was a continuum that provided scope for gods and wet nurses, for immaculate conception and multiple fatherhood, whereas today the genetic view of things prevails exclusively. The ambiguity that used to exist proved to be astonishingly flexible in relation to the changing context, while today we see the prevalence of unambiguousness and separation from context.

Our second hypothesis is that the perceived threat posed by ART results precisely from those fragments of the living that have now taken on essentialist features. In the case of a heterologous IVF, it is another man's essence, pinned down in sperm. The other man, essentialized in his sperm, threatens the couple by sneaking into the genome of the offspring. In the case of cloning, it is the genome as the pinned-down essence of the mother that replicates itself. The threat thus arises once reproduction loses its social context. Reproduction has been stripped of society and scientifically geneticized. A "social bond" in the truest sense of the term, which was clothed for centuries in social conventions and in love and power relationships, now presents itself in its stark genetic nakedness.

That is why one of the reasons for the mistrust evoked by ART and other biotechnologies is that they make clear what otherwise remains vague and concealed—the distinction between what is now perceived as essential (genetics) and everything else (which is relegated to an undifferentiated context). ART can isolate, mobilize, and transport both in time and space what is today perceived as essential. The DNA of the gametes or embryos can be placed in new, unfamiliar contexts—in other people and at other

points in time. The increased visibility of the building blocks of life is thereby part and parcel of the reductionist approach that is central to modern sciences and their successes.

The use of ART makes explicit the shifting, transport, and manipulation of the new biological forms, substances, and entities that now take on essentialist status. If a heterologous conception once resulted from an ephemeral or forbidden encounter, this became visible only when the children grew up and began to resemble a stranger or a friend of the family. Today this plays out in full public view. The highest precept, transparency, determines the official steps in an IVF procedure. Protocols dictate which predetermined path sperm and egg cells must take into the fertility clinics. The act of conception begins with a declaration of consent from the donors and recipients. In this as in all other biomedical processes, information is indispensable. Everyone is to be informed about everything, and everything is—and must be—visible and made transparent. The geneticization of conception, made visible, corresponds to the creation of social visibility that society demands.

Closely tied to the question of visibility is that of intention. Opponents of ART usually respond skeptically to the analogies between our ancestors' experience and current heterologous conception. They argue that the fact that children are born outside of wedlock is no reason to encourage engaging in this practice using technological means. This opposition mixes two arguments that we encounter repeatedly. The first argument comes from a deep-seated resistance to accepting that we are not solely at the mercy of chance but can freely decide. The opponents of biotechnologies can accept what happens by chance. But if it is intentionally brought to pass, then they find it unacceptable.

The second argument is based on the moral authority of nature: what is natural is also good. The case of Diane Blood shows how these arguments, which are related to each other, function in practice. If a married couple learns that the husband has only a few months to live and the woman becomes pregnant, this provides the raw material for a pretty story about love lasting beyond death. If the same woman achieves the same result by means of IVE, this is considered a deterring example of acting against nature.