

# The „Human enhancement“– narrative in science, newspapers, novels and movies

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The project is based on a timeline of events in science (eugenics, human genetics, molecular biology) (1). This time line determined the selection of articles from the Manchester Guardian (2) for the years 1908 – 1998. (The completion of the selection until 2012, the discovery of CRISPR-CAS9, is in progress). For the reconstruction of the narrative we have selected articles that indicate some connection to ‘human enhancement’ (for this workshop leaving out parallel references to critical arguments, mostly ethical. We provide relevant terms/catch phrases only).

This is followed (4) by a brief overview of the narrative in literary fiction (3). Finally, a first attempt at describing what is assumed to be the parallel narratives of negative and positive eugenics/human enhancement from the vantage point of the CRISPR-CAS9 discovery (originally written for a different occasion).

Note: these are very preliminary results from the project. The results from the sub-project on the narrative in film are in preparation.

## 1) FMS – Project: ‚Human enhancement‘ in science, literature and film (P. Weingart)

### Scientific events (selective)

#### 1) Improvement of the human race by F Galton first 1865

Search period: Dec. 1865 – Dec. 1869

(The theme of human improvement is explicit in positive Eugenics but only implicit in negative eugenics. It is one of the Research questions to what extent the discourse tended to one or the other option)

### Related scientific publications

Hereditary Talent and Character, *MacMillan’s Magazine* 12, 157-166; 318-327

F. Galton: ‚Kantsaywhere‘ In: *Life, Letters and Labours of Francis Galton* by Karl Pearson [1930] [\[1\]](#), vol IIIA pp. 414 - 424

A. Ploetz, founder of racehygiene in Germany: Utopian design in: *Die Tüchtigkeit unserer Rasse und der Schutz der Schwachen*, Berlin 1895

W. Schallmayer, Über die drohende körperliche Entartung der Kulturmenschheit, 1891 (s. RBG 38). S. has a *medical* perspective: fear of counterproductive effects of modern medicine on hereditary quality. (Negative eugenics)

## 2) Weismann's Theory of germ plasm

Search period: 1892 - 1896

1892: *Das Keimplasma: eine Theorie der Vererbung*. Jena: Fischer.

(supports the eugenic thesis that only natural selection drives evolution (against Lamarck).

Aggravates the degeneration problem: Civilization supports degeneration! Hygiene of procreation is the technical control of human evolution and, thus, the elimination of hardship and misery.

## 3) 1908: publication of Hardy/Weinberg law

G.H. Hardy, Mendelian proportions in a mixed population, *Science*, 1908, 107-122. W. Weinberg, Zur Technik familienstatistischer Untersuchungen über sozialbiologische Probleme, *Allg. statist. Archiv*, 1915, 9: 501-528.

Search period: 1908 - 1912

establishing population genetics and ultimately the basis for refutation of the eugenic world view. The articles were ignored for some time. Criticism of eugenics based on genetics started only after WWI.

## 4) 1928: Raymond Pearl (September 1927)

R. Pearl, Eugenics, ZIAV 1928, Suppl. 1 (Verhandlgn V. Internat'l Kongress f. Vererbungswiss): 261-282.

Search period: September 1927 – September 1931

Pearl criticizes eugenics as a departure from genetics.

Likewise Herman Muller, although praising Baur-Fischer-Lenz, criticizes their support of popular biases (317; 549).

**Gesetz zur Verhütung erbkranken Nachwuchses (GzVeN) (July 1933)**

## 5) The Geneticists' Manifesto 1939

"Social Biology and Population Improvement". *Nature*. No. 144. 16 September 1939. pp. 521–522.

Search period: September 1939 – September 1943

(enthusiastic program of genetic improvement of man and critique of NS racehygiene).

## 6) From race to population: the UNESCO declarations

**1949 and 1951**

L. C. Dunn/Th. Dobzhansky, *Heredity, Race and society*, New York 1946

Search period: 1946 – 1950 and 1951 – 1955

[https://en.wikipedia.org/wiki/The\\_Race\\_Question#The\\_1951\\_revised\\_statement](https://en.wikipedia.org/wiki/The_Race_Question#The_1951_revised_statement)

## 7) CIBA-Symposium Man and his Future 1962

G. Wolstenholme, *Man and his future*, Boston, 1963

Search period: November 1962 – November 1966

Wild thinking before the background of the discovery of recombinant DNA and the prospect of genetic engineering (646ff; 648!!) Transition from selectionist social technologies to molecular biological genetic fix.

[https://en.wikipedia.org/wiki/Recombinant\\_DNA](https://en.wikipedia.org/wiki/Recombinant_DNA)

[https://en.wikipedia.org/wiki/Genetic\\_engineering#History](https://en.wikipedia.org/wiki/Genetic_engineering#History)

## 8) President's Commission for the study of ethical problems in Medicine and Biomedical and Behavioral Research 1983

Search period: 1982 - 1986

Rejection of 'active eugenics'. Report on the Social and Ethical Issues of Genetic Engineering with Human Beings, originally not mandated by Pros. Comm.

## 9) Cloning: Dolly 1997

Angelika E. Schnieke,\* Alexander J. Kind, William A. Ritchie, Karen Mycock, Angela R. Scott, Marjorie Ritchie, Ian Wilmut, Alan Colman, Keith H. S. Campbell, Human Factor IX Transgenic Sheep  
Produced by Transfer of Nuclei from Transfected Fetal Fibroblasts,  
*SCIENCE* Vol. 278 19 Dec. 1997

Search period: Dec. 1997 – Dec. 2001

### 10) Human Genome Project April 2003

[https://web.ornl.gov/sci/techresources/Human\\_Genome/publicat/hgn/](https://web.ornl.gov/sci/techresources/Human_Genome/publicat/hgn/)

[Human genome: Quality assessment of the human genome sequence.](#)  
*Nature*, **429**, 365-368 (27 May 2004)

Search period: May 2003 – may 2007

### 11) CRISPR-CAS9

Search period: Dec. 2017 -

<https://www.forbes.com/sites/reenitadas/2017/12/14/gene-editing-with-crispr-cas9-the-next-step-in-human-evolution-to-be-worth-25-billion-by-2030/#4d15756a449f>

<https://www.thehindu.com/sci-tech/science/who-opens-global-registry-on-human-genome-editing/article29303484.ece>

## **WHO Urges countries to ensure a halt to all germline gene editing until ethical norms are framed**

An expert advisory committee of the World Health Organisation (WHO) has approved the first phase of a global registry to track research on human genome editing as the UN's international public health monitor seeks to address the ethical and regulatory challenges surrounding promising new technologies to address gene based treatments.

“New genome editing technologies hold great promise and hope for those who suffer from diseases we once thought were untreatable,” WHO’s director-general Dr. Tedros Adhanom Ghebreyesus said in a press release. “But they also pose unique ethical, social, regulatory and technical challenges,” he noted, adding that countries should not allow any further work on human germline genome editing in human clinical applications until the technical and ethical implications had been properly considered.

[https://de.wikipedia.org/wiki/Frankenstein\\_\(Roman\)](https://de.wikipedia.org/wiki/Frankenstein_(Roman))

[https://en.wikipedia.org/wiki/He\\_Jiankui\\_affair](https://en.wikipedia.org/wiki/He_Jiankui_affair)

The **He Jiankui affair** is a scientific and [bioethical](#) circumstance concerning the use of [gene-editing](#) in human cases following the first use by Chinese scientist [He Jiankui](#), who made the first genome-edited human babies in 2018.<sup>[1][2]</sup> The affair led to legal and ethical controversies with an indictment of He and his two collaborators, Zhang Renli and Qin Jinzhou.

...As a consequence to He's work, the [World Health Organization](#) launched a global registry in 2019 to track research on human genome editing, after a call to halt all work on genome editing.<sup>[17][18][19]</sup> In May 2019, lawyers in [China](#) reported, in light of He's experiment, the drafting of regulations that anyone manipulating the [human genome](#) by [gene-editing techniques](#), like [CRISPR](#), would be held responsible for any related adverse consequences.<sup>[20]</sup>

He Jiankui has been variously referred to as a "rogue scientist",<sup>[6]</sup> "China's [Dr Frankenstein](#)",<sup>[21]</sup> and a "mad genius".<sup>[22]</sup>

## **2) Enhancement narrative in Manchester Guardian 1908 – 1998 (D. Chartrand, P. Weingart)**

### **1908:**

Sept 30: "Curiously enough, the one dissentient was a lady doctor, who combated the suggestion that a science of Eugenics was necessary if the human material on which teachers have to work is to undergo radical improvement. In her opinion there was 'plenty of good material at hand,' and she traced all present evils to the deplorable conditions of our social system."

### **1909:**

Feb 10: "If the state adopted eugenic principles, it would have to consider whether all its citizens should be turned out according to some model of the best obtainable type or should be differentiated according to the functions which they would have severally to perform." – "Would the State breed human mastiffs for its policemen, human greyhounds for its postmen, and human retrievers for its gold caddies?—Laughter"

### **1910:**

Jun 29: "Another is the difficulty whether, leaving the unfit out of account, we are to aim at producing a good general average, in which case best and worst, second best and those just above the worst should mate, or at improvement of the race by mating best with the best, in which case we might get at a permanence of low types at the bottom."

Nov 18: "The only method of permanently improving the race was the method of eugenics."

**1912:**

07 Dec: "If the public were properly instructed in the laws of heredity they would soon learn that it was just as easy to breed intelligent healthy human beings as to raise a fine stud of racehorses... If England were to maintain her position among the nations of the earth she must raise up a healthy, intelligent, intrepid, fearless, self reliant, and progressive race, and not as in present when the submerged tenth was adding to the population a race of cowardly hooligans and untutored savages who in the case of an invasion would be worse than a useless encumbrance." – "The degenerate bred freely, but unfortunately, in the present day, there was no encouragement to a healthy, industrious, energetic, intelligent, hard-working man to have a large family." – "The advancement of the race largely depended on women, and, therefore, they should be educated in nature's laws."

19 Aug: "[A] new era in which the law, and still more public opinion, will take up the care of the period before birth, and will regulate, not merely the conditions of life for those already in being, but the whole question of birth and race advancement. Mr. Ellis is in no hurry to call in the law to aid his schemes – like Galton, he believes in leaving Eugenics, of the present, mainly to the individual"

**1928:**

13 Feb: "I am fully sensible of the world's need for better-bred people" – "Only within very narrow limits dare we say with any confidence what sort of human beings ought not to be produced."

**1928:**

25 mar: "[A]n increase in the progeny of the superior types is perhaps even more important."

**1930:**

13 Sep: "If we find that the way we are living is leading us straight to physical and mental bankruptcy, then we can no longer afford to be mere pawns on the chessboard of evolution. We must somehow take a hand in the game. If eugenists have their way human history enters a new or eugenic phase." – " 'Sir Arthur Kenth said that we could no longer afford to permit evolution to work blindly in our midst. 'Reproduction is to be brought before a tribunal of reason' – "The introduction of eugenic reform is a herculean undertaking.' "

12 Sept: "Their aim was to improve the races and breeds of mankind"

**1931:**

Oct 30: "We are not merely neglecting to improve the race; we were permitting it to deteriorate by excessive latitude given to the weak-minded by imposing burdens in the shapes of taxation on the hard-working to help out the improvidence of the inefficient and less capable, we were doing for the human race exactly what every intelligent breeder avoided in the animal world; we were stimulating breeding from the weak, the inefficient, and the unsound" – "Was it an idle dream to imagine that under scientific development of

eugenics the average child might receive at birth a physical and mental constitution far superior to the actual? Would not any small advance of this kind bring with it immeasurable gains of human happiness and self-realisation?"

**1933:**

"[T]he question of the quality of the population, Professor Haldane said that he did not think that the large plans of sterilisation of the 'unfit' persons such as was advocated by many eugenicists would be effective." – "But the most important eugenic measure is to stop the next war."

**1949:**

Dec 09: "Sterilisation of the unfit would help to prevent that increase in the community of unsatisfactory human stock"

**1950:**

04 Sept: "The question of preventing the increase of tainted human tainted stocks will have to be faced... now the world needed more good human stock."

**1951:**

May 05: "The findings prove conclusively that children from smaller families were more intelligent than those from larger ones"

20 Nov: "genetics holds, and will continue to hold, a pivotal position in human affairs"

**1962:**

20 Feb: "But much farther off, it will be possible to think of interfering with the seat of inheritance in living organisms, and thus of affecting the character of individuals or of their offspring." – "By these standards it may be comparatively unimportant, though no less accurate, that the events of the last few months have probably laid the first practical foundations for the artificial creation of living things."

25 Oct: "The use of eugenic knowledge might lead to marked improvement of physical and intellectual improvements." — "We must regard the extension of knowledge and the responsibility and opportunity which that gives for planning ahead as part of the providential purpose of God." – "This is not to say that every power and technique that comes into man's hands can be applied with gay abandon. Nor must we forget that by depriving men of their natural skills or the opportunity to exercise them, modern industrial societies may in fact take away some of the 'adulthood' of man."

**1963:**

26 Jan: "A Russian Government decree today calls on scientists to step up research and practical measures for 'prolonging human life and the ability to work.'"

**1964:**

20 Mar: "What, for example, would happen in the West if it became known that the Chinese, or even the Russians, were eugenically improving the intelligence of their people?"

19 Mar: "A breakthrough in man's undertaking of heredity--a step which might eventually lead to controls over the formation of life... The announcement made it clear that anything like a 'test tube man' was still a long way off."

**1966:**

Feb. 22: "A new breed of men?" – "...increasing knowledge of hereditary effects" – "Disturbing possibility...well beyond present knowledge"

**1982:**

Jan. 29: "Test tube baby pioneers plan banks of frozen embryos" ..."call for a moratorium" - .."The idea of a moratorium is ill-informed".

Feb. 10: "Debate call over test tube babies" - ..."it will become possible for an unlicensed private embryo bank to sell baby embryos to whoever they wish".

Oct. 27: "'Adopted' embryos attempted – this looks like a technique that will work."

**1983:**

March 14: "Sex change to become routine" – "Genetic engineers are likely to provide the perfect solution for persons of uncertain sex: they will be able to spend part of their lives as men and part as women..."

June 25: "Doctors ready to divide embryos" - ...scientists will be able to use one half of the baby to identify genetic defects...the family will be cleaned up by this technique"..

Aug. 25: "Advances in genetic engineering" – "Synthetic hormones to increase peoples learning capacity may be on the way. ...We stand on the threshold of a fabulously exciting era".

**1984:**

Feb. 11: "Gene machine man" – "...discovery of a synthetic growth hormone to treat dwarfism" ..

Mar 8: "Hanging on for dear life" - ..."biotechnologists are thinking about ways in which the apparently inexorable ageing process might be slowed down"...

April 13: "Test tube clinic near sex choice breakthrough" –

May 28: "What sort of people should there be? And who will decide?" – "...to avoid the danger of putting the genetic fate of the human race in the hands of a few decision-makers..."

July 19: "All human life in one debate" – "The Warnock Committee . .finds space to consider a few of the more exotic possibilities which could face us in the future: the creation through trans-species fertilization of a race of hybrid, half-human creatures..."

**1985:**

**1997:**



Feb. 18: "Rock-a-bye baby with the perfect genes" - ..."existing couples may one day be able to choose genes for their offspring much as they choose furnishings today..."

June 9: "Swiss cult offers to clone children" - ---launching a company to offer infertile or homosexual couples the chance to have a child cloned from one of them..."

Oct. 8: "Designer babies" – " the day may not be far away when we can choose every detail".

#### **1998:**

January 16: "How to live longer"

October 8: "Gene scientist confronts taboo" - ..."once the method is perfected it could just as easily be used to exchange or add genes that determine physical appearance."

December 9: "Brave new world ...needs brave new ethics" – "...macabre prospect of cloning an entire human being.."

### **3) Genetics and Human Enhancement in Literary Fiction (P. Hamann)**

The history of literary representations of eugenics and human enhancement has been marked by ambivalence. Occasionally, especially during the high times of eugenic thinking at the end of nineteenth century and the beginning of the twentieth century, there has been a tendency in literary writing to describe quite favourably the prospect or the need, even, to artificially dictate human evolution. More frequently, however, human enhancement has received a more sceptical treatment in literature, ranging from complex and ambivalent negotiations of new thinking about heredity and its impact on culture and society, to explicit condemnations of eugenicist practices. Throughout its history, literary explorations of human enhancement have captured and examined central cultural concerns, promises and anxieties surrounding new genetic concepts and technologies and their implications for human reproduction and development.

The theme of human betterment is central in an early example of literary fiction engaging with proto-genetic science and its implications for society as well as the individual. In Thomas Hardy's *Jude the Obscure* (1895), the working-class protagonist's attempts at improving himself through education are continually stifled by social restrictions. At the same time, the text reflects Hardy's familiarity with August Weismann's theory of the germ plasm, which fuelled the position of contemporary eugenicists claiming that inherited dispositions could not be remedied by environmental factors. Hardy's emphasis on social restrictions appear to counter such biological determinism but also does not fully reject it, as reproduction between seemingly unsuitable characters in the novel proves fatal and is directly linked with the text's tragic outcome. The novel presents the possibility of innate biological limitations, and thus the potential legitimacy of eugenics, as deeply troubling. Simultaneously, social factors like class and elitism are shown to be at least as limiting to human improvement as biological predispositions.

Hardy's ambivalence towards human heredity and improvement finds a much more pronounced expression in the 1920s. G. K. Chesterton's public criticism of eugenics, for instance, sparks parliamentary debates, while J. B. S. Haldane's speculative *Daedalus* (1924) imagines a future in

which genetic engineering enables new levels of positive eugenics. In the wake of increasing resistance against eugenic ideas, Aldous Huxley's 1932 dystopian novel *Brave New World* epitomises the cultural fears of human enhancement (through positive eugenics) at the time. The novel's prescient vision of artificial wombs and genetic as well as social conditioning presents a world in which individual freedom and autonomy is replaced by an ideal society based on eugenic concepts.

However, a growing discourse on genetic human improvement also produces literary fictions, like Robert Heinlein's 1942 *Beyond this Horizon*, which embrace the promise of positive eugenics. Generally, the possibilities of positive rather than negative eugenics appear to dominate literary negotiations. We find an exception in the story "The Marching Morons" (1951) by Cyril M. Kornbluth, which draws on and moderately condemns Third Reich strategies of negative eugenics through the elimination of parts of the population that have been deemed undesirable by the ruling elites.

The post-war fictional representations of human enhancement predominantly envision the potential of genetically altered human beings. In John Wyndham's novel *The Chrysalids* (1955), the prospect of humans with super-human abilities, however, is critically contextualised within a society that employs population control to enforce a normative society in which human difference is rejected. The notion of genetic improvement thus oscillates in the novel between the loss of human individuality and an ostracised super-human alternative.

Just like in Wyndham's novel, fictions of human enhancement in the 1960s, like Doris Lessing's *The Four-Gated City* (1969), frequently depict an improved human species as emerging from nuclear radiation. Lessing's positive interpretation of genetically transcending previous human limitations is contrasted with renewed visions of degeneration, this time as the result of radiation-fuelled genetic mutations, such as in J. G. Ballard's *The Drought* (1965). While Lessing and Ballard diverge in their views on the potential of mutational change, both link the fate of humanity with its genetic constitution.

Practices of positive eugenics continue to find expression in the second half of the twentieth century, for instance in the short story, later turned novel, *Ender's Game* by Orson Scott Card (1977/1985). In the narrative, population growth is strictly controlled and the reproduction of gifted individuals encouraged. On the backdrop of the new possibilities of genetic engineering afforded by recombinant genetics in the 1970s, literary fictions of human enhancement increasingly also envision human enhancement as radical departures from previous human societies. Joan Slonczewski's *A Door Into Ocean* (1986), for instance, imagines a genetically engineered all-female and ecologically conscious society. Here, as in Lessing's and Ballard's texts, genetic concepts of the organism give rise less to explicit eugenicist visions but continue more abstract notions of human enhancement achieved at the level of the genome.

The eugenic legacy of genetic science has been forcefully explored in literary fictions of the 1990s. In Simon Mawer's *Mendel's Dwarf* (1997), for example, the geneticist-protagonist directly links new genetic screening technologies to historical eugenics, including the eugenic atrocities committed by the Third Reich. Rather than bluntly rejecting such technologies, however, the novel elucidates their

complex cultural and ethical contexts. While upholding the problematic ethics of screening out particular embryos for implantation, the novel simultaneously explores the personal and medical reasons why someone might be willing to accept the ethical costs in exchange for a specific reproductive outcome.

In the early twenty-first century, eugenic thinking continues to be explored in literature. In Margaret Atwood's *MaddAddam* trilogy (2003-2013), for instance, eugenic practices are connected with ecological concerns, reflecting both the magnified visibility of genetic science at the turn of the millennium, especially through the Human Genome Project, as well as of ecological issues surrounding anthropocentric climate change. In the trilogy, positive and negative eugenic practices are combined in an attempt to halt the ecological collapse of the planet and replace human destructiveness with an improved post-human society that will harmoniously co-exist in the larger ecosystem. The novels squarely reject such eugenic visions but emphasise the general potential of genetic science not only for human health but also for the planet. It is not the genetic technologies per se to which the trilogy objects, which are imagined at a level of sophistication the discovery of CRISPR may now make possible, but to their abuses by individuals and corporations.

Atwood's trilogy exemplifies the critical potential of literature to explore from multiple perspectives the complex realities and discourses around new genetic concepts and biotechnologies. Besides such positive depictions of eugenics as in Heinlein's *Beyond this Horizon*, the majority of literary fictions addressing eugenics and human enhancement, from Hardy to Atwood, have criticised the shortcomings of eugenic thinking, without always refuting them completely. Literary representations of genetic interventions often enact a debate about their risks and benefits, especially with regard to conceptions of individual human worth and autonomy. More often than not, literary fictions of human enhancement do not side with either the risks or the benefits but showcase what is at stake in each case and defer judgement to the reader.

#### **4) The eugenic and human enhancement narratives (P. Weingart)**

The discovery of the CRISPR-CAS9 technology marks the endpoint so far of a development which is deeply rooted in human history as hardly any other. When the Chinese scientist He Jiankui declared in 2018 that he changed the hereditary material of babies in such a way as to make it resistant to HIV he was labeled as China's Dr. Frankenstein and shortly after sentenced to three years in prison and a steep fine. The labeling as Frankenstein does not refer to the famous literary figure of the early 19<sup>th</sup> century by accident. It stands for a repeatedly recurring theme since antiquity: the artificially created human being. Part of this is the fundamental ambivalence towards this dream of mankind. This is signaled by the subtitle of Mary Shelley's *Frankenstein*: 'The modern Prometheus', which points to the version of a Greek mythology in which Prometheus has created a human being from clay. The ambivalence is not only caused by the presumptuousness implied in surpassing the act of creation but by the loss of control over the loss of control over the artificially created man. The defectiveness of the copy, the loss of control and the forced destruction are the accompanying themes.

These few hints provide the background for the positioning of the historical and societal relevance of the CRISPR-CAS9 technology. It is not just any technology such as a new smartphone. It is the ultimate technology.

The modern history of this legacy begins in the 19<sup>th</sup> century. 1865 Gregor Mendel publishes the results of his pea experiments and formulates the 'laws' bearing his name. For a time they are forgotten to be 'rediscovered in 1900 by botanists Carl Correns, Hugo de Vries and Erich von Tschermak-Seysenegg. Already prior to that, motivated by Darwin's theory of evolution, the discussion of the degeneration of the population had it begun which by the early 1890's began to become scientific. 1891 Wilhelm Schallmayers, *Über die drohende körperliche Entartung der Kulturmenschheit* appeared. Schallmayer assumed a medical perspective: the fear of counterproductive effects of modern medicine on the hereditary quality of the population. 1892 Weismann's theory of heredity appears which dramatizes the problem of degeneration and supports the eugenic thesis that only natural selection advances evolution. 1895 Alfred Ploetz' *Die Tüchtigkeit unserer Rasse und der Schutz der Schwachen* appears. Ploetz is staken to be the founder of 'race hygiene'. Since that time, at the latest, two narratives evolve in parallel: that of the so called negative eugenics focused on the elimination of hereditary diseases, and the narrative of positive eugenics oriented to the 'breeding' of a 'higher' or improved human race which has found its successor in the discourse on 'human enhancement'. The intricate history of both narratives cannot be recounted here but it can be said summarily: negative eugenics with its focus on the control of human procreation (i.a. the interdiction of marriage between the mentally retarded) had its high time approximately between 1900 and 1945.

Eugenics was primarily established in the Anglo-Saxon and Scandinavian countries. In Germany, while established up to drafts of marriage laws in the Weimar Republic, it was abused under the National-Socialist régime. Here the medically motivated eugenic narrative was confounded with the race-hygienic narrative. The latter, in the guise of breeding schemes and visions of a Germanic blonde master-race was even put into practice rudimentarily (Lebensborn). The Geneticists' Manifesto of 1939, like the UNESCO Declarations on Race of 1950 and 1952 show that the international community of geneticists tried to mediate between the moral ostracization of the NS-race policy on the one hand and the promise of a public health policy resting on the progress of genetics. Their ambivalence has come to a head by the transition from the previous selectionist social technology to the molecular-biological 'genetic fix' signaled by the concept of 'genetic engineering'. The development of the recombinant DNA technology 1972 opened the perspective of a direct intervention into the genetic material. With that groundbreaking development the ethical concerns towards the new technology became more intense. 1983 the American President's Commission on the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research mandated a ban on all active eugenics. Human genetics from now on was limited to a passive (non-directive) advisory function.

That did not stop research. The cloning of Dolly followed in 1997 while the Human Genome Project was already well under way (1990 – 2003). It was terminated in 2003 after the full decoding of the human genome had been accomplished. „The international effort to sequence the 3 billion DNA letters in the human genome is considered by many to be one of the most ambitious scientific undertakings of all time, even compared to splitting the atom or going to the moon” ([2003: 50 Years of the Double Helix \(ornl.gov\)](#)). The development of the CRISP-CAS9 technology is the preliminary endpoint of this development.

He Jiankui's experiment triggered international protests and prompted the WHO to create a global register of all research projects on 'human genome editing'. Director-General oft he WHO, Dr. Tedros Adhanom Ghebreyesus, also demanded to stop all research until all technical and ethical implications had been orderly considered, this before the background that the “new genome editing technologies hold great promise and hope for those who suffer from diseases we once thought were untreatable. But they also pose unique ethical, social, regulatory and technical challenges”

<https://www.thehindu.com/sci-tech/science/who-opens-global-registry-on-human-genome-editing/article29303484.ece>).

In view of the developments of the rDNA technology and the accompanying possibilities but also the ethical problems molecular biologists in 1975 called a conference of 140 scientists (mostly biologists) in Asilomar in order to establish guidelines for the regulation of experiments including the ban or moratorium of experiments. The latter pertained to those that could have potential negative consequences for the population. Since by that time the scientists had to expect a sensitive public they tried to forestall their concerns by being transparent and inclusive. In March of 2015, before the background of CRISPR-CAS9, some of the former participants of the Asilomar-conference (i.a. Paul Berg and David Baltimore) sought to adapt the model to the new situation. Again, they suggested a global moratorium to analyze the ethical, legal and societal implications of 'gene-editing'. But the scientists wanted to retain the right „to push research to its limits“ for themselves.

The paradox is evident: to the degree that the possibilities of an effective intervention into the human genotype have been increased the narrative of enhancement has been contained by ethical concerns. Whenever progress in molecular biology leads closer to the prospect of a positive/active eugenics or a demand-oriented eugenics the narrative is pushed back and the ethically more unobjectionable medically focused narrative is given more weight. That is – at this point in time – even true for autocratic régimes as the case of He Jiankui shows. But two things are to be considered. On the one hand the dividing line between ethically unproblematic medical indications (hereditary diseases) and ethically more questionable optimizations which have dramatic societal implications becomes increasingly diffuse. On the other hand, with this the suitable forms of a participation of the public and an adequate control executed by it become ever more important but also more fragile (Jasanoff).