BRAVE NEW WORLD by Aldous Huxley (1894-1963)

Synopsis: The novel opens in the Central London Hatching and Conditioning Centre, where the Director of the Hatchery and one of his assistants, Henry Foster, are giving a tour to a group of boys. The boys learn about the Bokanovsky and Podsnap Processes that allow the Hatchery to produce thousands of nearly identical human embryos. During the gestation period the embryos travel in bottles along a conveyor belt through a factorylike building and are conditioned to belong to one of five castes: Alpha, Beta, Gamma, Delta, or Epsilon. The Alpha embryos are destined to become the leaders and thinkers of the World State. Each of the succeeding castes is conditioned to be slightly less physically and intellectually impressive. The Epsilons, stunted and stupefied by oxygen deprivation and chemical treatments, are destined to perform menial labor.

Excerpt from Chapter One:

A SQUAT grey building of only thirty-four stories. Over the main entrance the words, CENTRAL LONDON HATCHERY AND CONDITIONING CENTRE, and, in a shield, the World State's motto, COMMUNITY, IDENTITY, STABILITY.

The enormous room on the ground floor faced towards the north. Cold for all the summer beyond the panes, for all the tropical heat of the room itself, a harsh thin light glared through the windows, hungrily seeking some draped lay figure, some pallid shape of academic goose-flesh, but finding only the glass and nickel and bleakly shining porcelain of a laboratory. Wintriness responded to wintriness. The overalls of the workers were white, their hands gloved with a pale corpse-coloured rubber. The light was frozen, dead, a ghost. Only from the yellow barrels of the microscopes did it borrow a certain rich and living substance, lying along the polished tubes like butter, streak after luscious streak in long recession down the work tables.

"And this," said the Director opening the door, "is the Fertilizing Room."

Bent over their instruments, three hundred Fertilizers were plunged, as the Director of Hatcheries and Conditioning entered the room, in the scarcely breathing silence, the absent-minded, soliloquizing hum or whistle, of absorbed concentration. A troop of newly arrived students, very young, pink and callow, followed nervously, rather abjectly, at the Director's heels. Each of them carried a notebook, in which, whenever the great man spoke, he desperately scribbled. Straight from the horse's mouth. It was a rare privilege. The D. H. C. for Central London always made a point of personally conducting his new students round the various departments.

"Just to give you a general idea," he would explain to them. For of course some sort of general idea they must have, if they were to do their work intelligently–though as little of one, if they were to be good and happy members of society, as possible. For particulars, as every one knows, make for virtue and happiness; generalities are intellectually necessary evils. Not philosophers but fret-sawyers and stamp collectors compose the backbone of society.

"To-morrow," he would add, smiling at them with a slightly menacing geniality, "you'll be settling down to serious work. You won't have time for generalities. Meanwhile …"

Meanwhile, it was a privilege. Straight from the horse's mouth into the notebook. The boys scribbled like mad.

Tall and rather thin but upright, the Director advanced into the room. He had a long chin and big rather prominent teeth, just covered, when he was not talking, by his full, floridly curved lips. Old, young? Thirty? Fifty? Fifty-five? It was hard to say. And anyhow the question didn't arise; in this year of stability, A. F. 632, it didn't occur to you to ask it.

"I shall begin at the beginning," said the D.H.C. and the more zealous students recorded his intention in their notebooks: *Begin at the beginning*. "These," he waved his hand, "are the incubators." And opening an insulated door he showed them racks upon racks of numbered test-tubes. "The week's supply of ova. Kept," he explained, "at blood heat; whereas the male gametes," and here he opened another door, "they have to be kept at thirty-five instead of thirty-seven. Full blood heat sterilizes." Rams wrapped in theremogene beget no lambs.

Still leaning against the incubators he gave them, while the pencils scurried illegibly across the pages, a brief description of the modern fertilizing process; spoke first, of course, of its surgical introduction–"the operation undergone voluntarily for the good of Society, not to mention the fact that it carries a bonus amounting to six months' salary"; continued with some account of the technique for preserving the excised ovary alive and actively developing; passed on to a consideration of optimum temperature, salinity, viscosity; referred to the liquor in which the detached and ripened eggs were kept; and, leading his charges to the work tables, actually showed them how this liquor was drawn off from the test-

tubes; how it was let out drop by drop onto the specially warmed slides of the microscopes; how the eggs which it contained were inspected for abnormalities, counted and transferred to a porous receptacle; how (and he now took them to watch the operation) this receptacle was immersed in a warm bouillon containing free-swimming spermatozoa–at a minimum concentration of one hundred thousand per cubic centimetre, he insisted; and how, after ten minutes, the container was lifted out of the liquor and its contents re-examined; how, if any of the eggs remained unfertilized, it was again immersed, and, if necessary, yet again; how the fertilized ova went back to the incubators; where the Alphas and Betas remained until definitely bottled; while the Gammas, Deltas and Epsilons were brought out again, after only thirty-six hours, to undergo Bokanovsky's Process.

"Bokanovsky's Process," repeated the Director, and the students underlined the words in their little notebooks.

One egg, one embryo, one adult-normality. But a bokanovskified egg will bud, will proliferate, will divide. From eight to ninety-six buds, and every bud will grow into a perfectly formed embryo, and every embryo into a full-sized adult. Making ninety-six human beings grow where only one grew before. Progress.

"Essentially," the D.H.C. concluded, "bokanovskification consists of a series of arrests of development. We check the normal growth and, paradoxically enough, the egg responds by budding."

Responds by budding. The pencils were busy.

He pointed. On a very slowly moving band a rack-full of test-tubes was entering a large metal box, another, rack-full was emerging. Machinery faintly purred. It took eight minutes for the tubes to go through, he told them. Eight minutes of hard X-rays being about as much as an egg can stand. A few died; of the rest, the least susceptible divided into two; most put out four buds; some eight; all were returned to the incubators, where the buds began to develop; then, after two days, were suddenly chilled, chilled and checked. Two, four, eight, the buds in their turn budded; and having budded were dosed almost to death with alcohol; consequently burgeoned again and having budded–bud out of bud out of bud–were thereafter–further arrest being generally fatal–left to develop in peace. By which time the original egg was in a fair way to becoming anything from eight to ninety-six embryos– a prodigious improvement, you will agree, on nature. Identical twins–but not in piddling twos and threes as in the old viviparous days, when an egg would sometimes accidentally divide; actually by dozens, by scores at a time.

"Scores," the Director repeated and flung out his arms, as though he were distributing largesse. "Scores."

But one of the students was fool enough to ask where the advantage lay.

"My good boy!" The Director wheeled sharply round on him. "Can't you see? Can't you see?" He raised a hand; his expression was solemn. "Bokanovsky's Process is one of the major instruments of social stability!"

Major instruments of social stability.

Standard men and women; in uniform batches. The whole of a small factory staffed with the products of a single bokanovskified egg.

"Ninety-six identical twins working ninety-six identical machines!" The voice was almost tremulous with enthusiasm. "You really know where you are. For the first time in history." He quoted the planetary motto. "Community, Identity, Stability." Grand words. "If we could bokanovskify indefinitely the whole problem would be solved."

Solved by standard Gammas, unvarying Deltas, uniform Epsilons. Millions of identical twins. The principle of mass production at last applied to biology.

SCIENTISTS CLONE HUMAN EMBRYOS TO MAKE STEM CELLS

by Rob Stein and Michaeleen Doucleff 2013

Scientists have long been interested in harnessing the power of stem cells, which are undifferentiated, self-replicating cells that are capable of becoming differentiated cells within an organism. Pluripotent stem cells, which include embryonic stem cells, are capable of giving rise to any cell in an organism. Scientists believe that learning more about stem cells will allow them to develop treatments and potential cures for a variety of diseases. However, many object to the use of embryos for scientific purposes. In 2001, U.S. President George W. Bush signed an executive order restricting federal funding for research on stem cells obtained from human embryos; in 2009, U.S. President Barack Obama overturned the ban.

Scientists say they have, for the first time, cloned1 human embryos capable of producing embryonic stem cells.

The accomplishment is a long-sought step toward harnessing the potential power of embryonic stem cells to treat many human diseases. But the work also raises a host of ethical4concerns.

“This is a huge scientific advance,” said Dr. George Daley, a Harvard stem cell scientist who wasn’t involved in the work. “But it’s going to, I think, raise the specter of controversy again.”

The controversy arises from several factors. The experiments involve creating and then destroying human embryos for research purposes, which some find morally repugnant. The scientists also used cloning techniques, which raise concerns that the research could lead to the cloning of people.

Ever since human embryonic stem cells were discovered, scientists have had high hopes for them because the cells can morph into any kind of cell in the body. That ability means, in theory, that they could be used eventually to treat all sorts of illnesses, including diabetes, Alzheimer’s, Parkinson’s and spinal cord injuries.

So for years, scientists have been trying to use cloning techniques to make embryonic stem cells that are essentially a genetic match for patients. The idea is that such a close match would prevent their bodies from rejecting the cells.

“It’s been a holy grail that we’ve been after for years,” says Dr. John Gearhart, a stem cell pioneer at the University of Pennsylvania.

But every previous attempt ended in failure or fraud, leading many scientists to wonder if the goal might be impossible to reach.

However, Shoukhrat Mitalipov of the Oregon Health & Science University and his colleagues never gave up. They succeeded in mice and monkeys. And in this week’s issue of the journal Cell, Mitalipov’s team reports they finally did it in humans.

“I’m very excited,” Mitalipov says. “It’s a very significant advance.”

The researchers first recruited women who were willing to provide eggs for the research. Next, they removed most of the DNA from each egg and replaced the genetic material with DNA from other peoples’ skin cells.

Then, after a long search, they finally found the best way to stimulate each egg so that it would develop into an embryo without the need to be fertilized with sperm. The key turned out to be a combination of chemicals and an electric pulse.

“We had to find the perfect combination,” Mitalipov says. As it turned out, that perfect combination included something surprising: caffeine.

“The Starbucks experiment, I guess,” quipped Daley. “This little change in the cocktail was what really allowed the experiment to really ultimately succeed.”

That ingredient, plus other tweaks in the process, including using fresh eggs and determining the optimal stage of each egg’s development, Mitalipov says.

The researchers showed that the resulting embryos could develop to a stage where they could produce healthy stem cells containing the genes from the skin cells. They even showed that the stem cells could be turned into other types of cells, including heart cells that in a laboratory dish could pulse like a beating heart.

The work drew immediate criticism because of ethical concerns.

First of all, the Oregon researchers compensated women financially to donate eggs for the experiments — something many in the field have considered ethically questionable.

But beyond that, the creation and destruction of a human embryo is morally repugnant to people who believe an embryo has the same moral standing as a human being.

“This is a case in which one is deliberately setting out to create a human being for the sole purpose of destroying that human being,” says Dr. Daniel Sulmasy, a professor of medicine and a bioethicist at the University of Chicago. “I’m of the school that thinks that that’s morally wrong no matter how much good could come of it.”

Moreover, Mitalipov used the same method that researchers used previously to clone Dolly the sheep. That approach raises the possibility that scientists could try to clone a human being.

“This raises serious problems because it is the first actual human cloning,” Sulmasy says. “We already know there are people out there who are itching to be able to be the first to bring a cloned human being to birth. And I think it’s going to happen.”

But Mitalipov dismisses those concerns. He says the embryos he created aren’t the equivalent of a human being because they weren’t fertilized naturally. And his experiments with monkeys indicate that it’s unlikely that they could ever develop into a healthy baby.

“The procedures we developed actually are very efficient to make stem cells, but it’s unlikely that this will be very useful for kind[s] of reproductive cloning,” Mitalipov says.

Other researchers agree with him and argue that the possible benefits of the research outweigh the concerns. “Where you can improve [a patient’s] quality of life tremendously through this kind of technology, I personally believe that it is ethical to use material like this,” Gearhart says.

The scientists acknowledge that it will be years before anyone knows whether this step will actually result in treatments that might help patients. In the meantime, it’s clear that the intense debate over embryonic stem cells is far from over.