

'What', 'How' and 'Why' of Nuclear Cloning

Will It Be Possible to Produce 100 Einsteins, 50 Mother Teresas and 500 Hitlers?

By Scientix.

The Western science started its journey, 500 years back, to explore the world through its own special method - the method of basing the quest for truth on a mechanical philosophy. 'Avoid God as far as possible' was the axiom (a 'mantra'). Starting from Copernicus (1473-1543) to Kepler, Galileo, Bacon, Descartes, Newton, the Godless journey went on with flying colours. On 28th April 1686 when Newton read his "Principia" before the Royal Society, God's disappearance was almost certain. Within the next 100 years, Laplace was to tell Napoleon "Je nai pas besoin de cette hypothese" - We do not need this hypothesis. He meant the hypothesis of God. In 1796 (remember '96) he wrote "System of the World". There was no need for a God to create planetary systems or the sun or the earth or indeed anything at all. Every thing was a mechanistic process.

Since then God was accelerating away from the 'scientific' vision. Within 200 years even the life or birth of a human was to be just mechanical. On 5th of July 1996 (here is '96) Dolly, a sheep, was born through a mechanical process, as an exact genetic replica of another sheep-not being her birth-giving mother, but some other sheep.

There was a stunning sensation mainly amongst journalists, news-paper and media people, ethical and religious groups, and lawyers and politicians. If a sheep can be copied by this method, called as cloning, copying of humans should not be far away. And if that comes, what happens? We may be able to produce an academy of 100 Einsteins or a team of 100 Michael Jordans or a band of 100 mad Michael Jacksons. Or we can imagine a team of genetists rushing to the parents of a dying child and saying, "Oh don't worry; just take one drop of blood from her. We will make exact copy for you;" or for an already dead child, "Have you a thread of her hair? Give us, we will make an exact copy again in your own womb, mother dear." We humans can now be our own creators. 'Why have God,' when we can get back alive out of this life itself, by creating a clone of ourselves to live on after us? So asked one Stanley Hauerwas, stated to be a divinity professor. (I do not know what a divinity Prof. means). He was echoing Laplace after 200 years (to the year 1796-1996).

Some people say that God and His Prophets and Saints and wise-men are crazy jokers. Even scriptures are also joking often. We have, in Haptan Yashta, a donkey standing in the midst of a vast ocean, and a Pahalvi book says that the donkey has three legs! We find our Prophet (reported by high-brow translators) asking for ten **pregnant** mares and one camel. Sounds crazy, isn't it? The reason why I slipped to these joking wise-men of God is that **Dolly is a sheep, and somehow John the Baptist calls Lord Jesus as Lamb of God. "The next day he saw Jesus coming toward him and said, "Behold the Lamb of God who takes away the sin of the world."** (John 1 :29) A scientist Stephen Gould says, "Dolly must be the most famous sheep since John the Baptist" designating Lord Jesus as a sheep. Somehow the Prophets are designated as shepherds i.e. those who take the sheep to feed in the pasture, say like Moses. Lord Krishna of course goes out in the jungle often with his cows and sheep, and Lord Jesus Himself is described as a shepherd; and Asho Zarathushtra is "Vastryo Fashuyansh", a green pasture shepherd. Sheep and shepherds are almost next of kin.

Right from the time Dolly-explosion took place in 1996, some readers of this humble magazine requested us to say something on it. So, here goes the story.

It is not artistic to say the end of a good story, first. But here an exception is to be made. The end of the story is : **whereas it may be possible to use cloning for giving children to infertile parents without the sexual union, and may become possible to have a seemingly duplicate of a person, it is NOT JUST POSSIBLE to have even one exact duplicate of Einstein or Michael (Jordan or Jackson as the case may be) or Monica (Lewinsky or otherwise as the case may be). The duplicate may look the same, but never THE same.** There are several good scientific reasons for the aforesaid possibility and impossibility, both.

So unlike the King ordering Alice to "begin at the beginning, and come to the end, then stop", I have begun with the end and now go to the beginning. I have taken long to declare the end and then begin, in order to put you in good mood to be able to absorb some real technical science.

YOU ARE MADE OF CELLS

Confining us to the West oriented science of biology and forgetting (for the time being) all the Eastern and Western mystical sciences, YOU, like every other human, are made up of billions of cells. All other living creatures are also made of cells. Their number varies in each species. Very very small creature, like bacteria - micro-organisms - have only one cell.

Cell is a unit of living matter - the smallest unit of life capable of an independent existence.

What is it made up of? Like all matter it is made up of atoms, but only a small number of them: carbon, hydrogen, oxygen, nitrogen, phosphorous, sulphur. (These are from the table of, 92 atoms we learnt at school). You can obtain them from any chemist; and you can mix them and treat them (say with heat or electricity) in any way you like, but you will never get a life-cell which will start crawling. The life-giving property of a cell comes from a fantastic and amazing arrangements of these atoms in most bizarre and exotic forms and patterns and assemblies and structures and configurations.

Atoms combine in a special way to form molecules. Two hydrogen atoms and one oxygen atom combine in some unique way to form one molecule of water. Atoms of matter naturally existing in our physical world are 92 (or a little more); but their special combinations to form molecules are billions. Sometimes two molecules may be a combination of the same atoms and in the same number, but differ radically from each other. For example, C_2H_6O is a molecule with 2 (C) carbon atoms, 6 hydrogen (H) atoms and one oxygen (O) atom. But there are two entirely different kinds of molecules with the same atoms in the same number. One is "ethyl alcohol" and the other is "dimethyl ether". The former is the constituent of our usual Parsi peg - whisky or rum or whatever, which can give you a great and glorious feeling, temporarily. But the latter is a poisonous gas which can send you off, permanently. The difference is solely due to the manner of combination or more correctly configuration. Alcohol is CH_3-CH_2-OH and dimethyl ether: CH_3-O-CH_3 . (Both: C_2H_6O .)

I wrote this to give you an idea of these molecular combinations. Life is all molecules and molecules; all biology is molecular. They are molecules which have life-giving properties.

The cell, the unit of life is not just one molecule but an assembly and factory of different combinations of different molecules, specially formed and configured, a most wonderful assembly which works with amazing efficiency and precision.

To express it simply (too simply), a cell is a unit enclosed in a membrane, a kind of molecular wall. It has a nucleus as a central assembly of different kinds of molecules. Nucleus is not necessarily at the center of a cell. Cell changes it's shape while working as a life-unit. It dances almost madly but with great precision.

It is this nucleus, that has stored in it all the genetic materials, of which we are all made up. All our hereditary traits including the color of the eye or an inheritad disease and now they say even vices and virtues

are a result of the dancing molecules in the nucleus.

The nucleus is surrounded by a jelly like substance cytoplasm, which again has its own dances of other kinds of molecules.

PROTEINS, THE WHEELS OF LIFE

All the life dances are performed by a special type of molecules called proteins.

Proteins are the ultimate stuff of life – the ultimate molecular configurations, which enable us to live. There are proteins and proteins in us. Some make our skin, claws, bones, tendons, ligaments. (They are called Keratin and Colbagen). There are proteins which make our muscles move. There is another, hemoglobin in blood, which transports oxygen. Let a medical Doctor and research scientist of great thinking power Michael Denton of Sydney speak on what a protein is. (These Michaels are an odd lot).

"If we think of the cell as being analogous to a factory, then the proteins can be thought of as analogous to the machines on the factory floor which carry out, individually or in groups all the essential activities, on which the life of the cell depends. Each protein is a sort of micro-miniaturised machine so small that it must be magnified a million times before it is visible to the human eye. ("Evolution, A Theory in Crisis" - Adler & Adler 1985).

In science you are required to ask a question: "What is in it?", until you are exhausted and come to a point from where you have to stop repeating the question. What is in a protein? In it there is a long chain of molecules called amino acids. Some 20 such amino acids combine in fantastic unions to make up various proteins. But leave amino acids here.

What is more important is the nucleus of the cell, said to contain all its genetic material, be it in a bacteria or donkey or monkey or man. It has been found that the nucleus has in it another types of molecular combinations, much more amazing than all others. They are called DNA and RNA. Both belong to a class of molecules known as nucleic acids. DNA is "deoxy-ribo-nucleic acid" and RNA is "ribonucleic acid". (Don't bother on what is that). They have "the role of the library or memory bank containing all the information necessary for the construction of all the various machines (i.e.) proteins" (Micheal Denton again). DNA is the head office in the nucleus. RNA is the carrier of information stored in DNA to all the various parts of the cell where particular proteins are being manufactured. RNA is like the photo copy of the master blue print in DNA, and carries the copies to the factory floor.

DNA is also the store house of genetic information. It contains certain chains of some unique kinds of molecules entwined like two spiral staircases - double helix. In the code language, there are 4 types of such molecules C, G, A, T. and their sequences in the spiral determine all the genetic traits. (So they say). A gene is a long combination of these C, G, A T in various orders like GCA - GCG - GCT – GCC..... These combinations themselves are arranged in long sets. **One such set is called "a Chromosome". Chromosome is thus a structure in a cell nucleus that carries the genes; and a gene is a unit of inherited material encoded by DNA and transcribed by RNA. We can say that genes in us are located on the chromosomes.** In other words a chromosome is a set, or unit or structure or chain made up of several genes. A gene is a unit carrying genetic material; and genetic material is made of DNA molecules and encoded in their inner molecules C, G, T, A in certain sequential chains or steps or combinations. Thus, the question "what is IN it?" starts from chromosome to gene to DNA to C, G, A, T. The sequences and orders of placements of C, G, A, T, constitute the basic genetic material. One gene is a chain of several such CGAT combinations. And several such chains combine to form one chromosome.

Now a step further in our journey from you to Dolly.

We humans have 46 chromosomes in each of our living cells. These 46 go around in the cell **in pairs of two**. This means we have **23 pairs** of chromosomes in a living cell, and (here we are approaching Dolly), in each pair one chromosome is from the father and one from the mother. Or we can say, in our cell 23 chromosomes are father's and 23 mother's. Complete equality of sex on sheer arithmetical basis. (But in biology numbers do not prove equality or superiority. For instance, a garden pea has 14 chromosomes, but potato has 48 and cray fish, 200; we have only 46.

Now the question: how did all these cell factories start? So we now transit to sex, sex cells, sexual reproduction.

A cell is never static. Tremendous factories are going on within it. It not only works but divides itself into two i.e. it duplicates itself. A cell with 46 chromosomes in its nucleus duplicates itself and creates another, again with 46 Chromosomes. When the division is to occur, certain protein molecules act as spindles and organise the chromosomes into position in the middle of the cell; and then the replication is triggered.... One, two, three, four, five phases.... and lo! the replica is here. This amazing process is called mitosis.

But there is another cell division process where the divided cell does not have 46 Chromosomes but only half of them i.e., 23. It is not 46 Chromosomesd cell producing another 46 chromosomed cell. It is 46 chromosomed cell dividing itself into two cells of 23 chromosomes each. These are called germ-cells or sex cells or gametes. A male has such sex cells in his sperm, and a female, in her egg. The two fuse during the sexual union; 23 Chromosomes in the sperm and 23 in the egg fuse, and the first cell of life with 46 chromosomes in its nucleus is born. It starts dividing itself with tremendous speed and the newly made cells then form the body of the child.

The genetic materials from the father and mother both have thus combined in the nucleus of the child's cells. The child thus inherits the genetic characters from both the parents. The point to remember is that all the genetic materials are stored in the nucleus of the child's cell and not in the area surrounding the nucleus.

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HERE COMES DOLLY (2)

HOW WAS THE SHEEP DOLLY BROUGHT INTO BEING?

Some Glimpses of the Science of Cloning

By Scientix.

We are on our way to Dolly, the cloned sheep. We had to start with YOU. Who are YOU? No philosophy or religion, please. We are dealing here with Godless science. So that question is to be transformed into the language of that science. The question, then, will be: "What are YOU made of and how?" The answer is : YOU are made up of cells; a cell is a unit of life, which is like an amazing factory, working ceaselessly, generating life molecules called proteins and also duplicating itself.

YOU know that you were born of your parents. (Happy birthday.) Your parents were also made up of cells. They had (like every human) two sets of cells. One set was of sex cells, and the other, of non-sex cells. Non-sex cells had 46 chromosomes and sex cells had 23.

What is a chromosome? Chromosome is a unit of certain molecular configurations, carrying all the hereditary traits. It is an important ingredient of every cell. The chromosomes are dancing in the nucleus of the cell. Nucleus has (roughly) a central part in the cell; between the nucleus and outer wall-boundary of the cell also, tremendous dances are going on.

To meet Dolly, the first fact of science required to be known is that all the genetic materials i.e. all the molecular formations for all hereditary characters are housed in the nucleus. You have inherited many traits from the chromosomes dancing in the nuclei of your parents' cells.

How did that happen? A little while ago I told you that we have two sets of cells: sex cells with 23 chromosomes and non-sex cells with 46 chromosomes. The sex-cells in a **male is called sperm**; in female, the **egg**. Although both have 23 chromosomes in their nuclei, there are structural and functional differences. Sperm has a head capsule containing the nucleus, a middle portion and a long tail. Egg is simpler in structure. It has a nucleus with 23 chromosomes and the surrounding materials extending upto the boundary wall. The egg cell is made to receive the sperm-cell. The sperm cell is made to penetrate the egg cell and enter it. When the sperm thus goes in the egg, the egg is said to be fertilised. It now has in it the first birth cell with 46 chromosomes - completely programmed mini factory, which immediately goes in action and begins to duplicate and multiply with tremendous speed.... Ultimately in about 266 days from the first step of fertilisation, the full baby is born. Here goes... The cry of agony from the baby, but that is a cry which rejoices the parents. Agony and ecstasy!

Now, if this birth of a baby is basically an entry of one sperm-cell into one egg-cell, can that be done without sex? What is required is to place a sperm in the female egg. That, you may be knowing, is being done. There are sperm donors and sperm banks. Take one sperm from them and implant it in the egg within the female, where it can grow in the same way as implanting a sperm through sexual union. The process of this asexual implanting of the sperm in the female womb is not simple; but it is in vogue. By the way, this is spoken of as a test-tube baby, which creates a false impression that the baby is fertilised in a test tube. The fertilised egg has to be placed in the womb of the female for the full term of 266 days.

The cloning of the Sheep Dolly, announced in February 1997 was not this kind of asexual union. It was quite a different procedure. It did not bring a sperm from some male and egg from some female together to form a fertilised egg. In fact, no male was involved. Let me describe the process in as simple (perhaps too simple) way as possible.

In the first place keep it in mind that here the process of cloning is done not on humans but on sheep. There are two sheeps in this drama. One is the real mother and the other is the surrogate mother. Dictionary meaning of surrogate is "a person or a thing acting as a substitute". A surrogate mother means the mother substituted for the real mother. (You will understand the difference between real and surrogate as you go on

reading.) Let us name the real mother sheep as Diana and the surrogate as Suzi. Diana was a sheep who was in an advanced state of pregnancy, induced by the normal sexual union with a male sheep. Now a sheep is a mammal. Mammal is a class of animals whose main characteristic is that the females have mammary glands i.e. milk producing glands. In humans, they are the female breasts. During pregnancy the glands become bigger and after delivery they secrete milk.

There is an Animal Breeding Research Station in Scotland, now known as Roslin Institute. One PPL Therapeutics Ltd. is a tiny biotechnology company. Its main purpose was to commercialise researches carried on at Roslin Institute. The researches were directed to make new drugs through genetic engineering. Sheep are cheap in Scotland, so the researches centered round them. The scientists would take out sheep cells and grow them in the laboratory. They would then add some new genes to the cells. Such modified cells may make specific proteins, which could be a new drug for some specific disease.

As a part of these researches, cells were taken out from the mammary glands of Diana, who was in advanced state of pregnancy. They were kept and preserved, frozen in the Institute' laboratory.

Can we 'clone' a sheep *from* these cells? This was the question on which a team of scientists – embryologists and genetic engineers – headed by one Jan Wilmut pondered and worked at the Institute. Cloning means copying cells. We have seen that two cells duplicate with all their genetic constitution intact. Can a cell with the additional genes carrying the new drug be implanted in a sheep's womb so that the baby born would be a living factory of these new cells i.e. the new drug?

Cells *from* Diana's mammary glands were taken. Now imagine one such cell *from* Diana. It has a nucleus with all genetic material stored in it. Let that nucleus be taken out. Then take this isolated nucleus to the other sheep Suzie. Take out one egg cell *from* Suzie. (We have seen, egg cell is the female sex-cell with 23 chromosomes in its nucleus.) Now remove the nucleus *from* Suzie's cell; what remains is an egg cell without a nucleus. Implant the nucleus *from* Diana's cell into Suzie's cell. So here is an egg cell originally *from* Suzie, but now carrying the nucleus of Diana's cell. All the genetic material *from* Suzie's own cell is replaced by Diana's genetic materials. (It is the nucleus which carries these materials, as we have seen).

Now implant this cell into the womb *of* Suzie and observe whether it now starts its baby forming process and develops into a full baby, and is duly born thereafter. If this happens, the baby will carry all genetic characters of Diana; it will be a full duplicate of Diana, grown in Suzie's womb.

And it did happen. On 5th July 1996 Dolly was born of Suzie. She looked exactly like Diana. She was Diana's duplicate, the clone.

I have here over simplified the cloning experiment. It was a result of years of research. Every step in the process called *for* precision, and was faced with several failure-risks.

Please note that the name Dolly was given by Jan Wilmut and his team. The names Diana and Suzie are my own inventions. Diana being Dolly's real mother, has the first letter 'D'; and Suzie being surrogate mother starts with 'S'. I hope you have now understood the difference. Diana is 'real', because her genetic materials are cloned into Dolly. Suzie is surrogate because all that she did was to have Diana's cell - nucleus in the womb and allow it to grow there; and then gave birth to Dolly.

Some of you may question: who is the real mother? One who carries in her the baby *for* a full period or one who just supplied a nucleus? Now the sheep community and the scientists community do not bother about this question. Actually as it turned out, poor Diana, the so called real mother was butchered and eaten, in the normal course; she was a sheep meant to be slaughtered. Nobody knew that she was responsible *for* the whole turmoil that followed Dolly's birth.

There is one interesting story about Dolly. It is said that the Scottish Scientist, the famous Jan Wilmut and his team named Dolly after Dolly Parton, an actor singer, whose main point of attraction are her breasts. (Sorry, if I am shocking the modesty of the serious minded readers, if any). Today many modern girls and women are fond of exhibiting their breasts in many ingenious ways. The gland of motherhood is today the symbol of carnal passion. So much so that the size of the breasts can be expanded by surgery. Some people

believe that probably Dolly Parton might have resorted to a surgically scientific intervention to have 'them' bigger. One William Jan Miller (Professor of Law, Michigan University) wrote an article bearing the title "Sheep, Joking, Cloning, and the Uncanny" wherein he pointed out that in the Western culture many a sex jokes are spun around sheep; here in Dolly episode, the nucleus was taken *from* the 'breasts' (i.e. mammary glands) of Dolly's 'real' mother, and when Dolly breathed her first on this planet earth, she was named after Dolly Parton, famous *for* 'their' size. So, Miller says, "So we come full circle: Sheep, breasts, sex, Dolly and science." He points out a further twist in the joke that is Dolly, namely that "Where Dolly P's plastic surgeon merely made a breast into a larger breast, these researchers made a breast into a woman" though of different species. ("**Clones and Clones**" edited by Nussabuum and Sunstein - 1998, Norton). Remember? The nucleus of the cloning cell was *from* Diana's mammary glands.

And may I add my own twist to the joke? John the Baptist called Lord Jesus a lamb "who **takes away** the sin of the world", and now a lamb has arrived **to add** to the sins of the world; sex is not required *for* human reproduction; it can now be used just *for* lust and passion..... From Christ to Dolly..... A fall into the bottomless pit, a jump in the quicksand....

A POETIC SCIENTIST ON A BIRD'S EGG

What is an egg?

A song is there in chemical notation

Invisibly packed into genes;

Also detailed instructions for nest building

A menu or two, and a map of stars.

All in the one cell that multiplies into many,

All put at the disposal

Of the little feathered passenger

So, once hatched and fledged

He will have more than a wishbone

To launch his life

- **Guy Marchie** in "*The Seven Mysteries of Life*"

(Houghton Milfin Co., Boston 1981 - p. 647)

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HERE COMES DOLLY (3)

It is Just Not Possible to Create a Duplicate Human Through Cloning.

- by Scientix

Diana, Suzie, Dolly, Dolly Parton, making a breast into a woman, and John the Baptist calling Lord Jesus a lamb "who takes away the sin of the world".... What a colourful subject we are on! Cloning! Making a duplicate animal! Today a sheep is duplicated; to morrow it can be a human. (They call man a "higher" animal. 'High' in what? Cruelty and killing? But that is another story). Can we duplicate Einstein or Mother Theresa or O. J. Simpson or Princess Diana (if you like) or Hr Hitler (even if you don't like)?

In the Jan-Feb and March 1999 issues of this humble magazine, I had given you an over simplified version of the procedure called cloning and how Dolly, the sheep breathed her first on 5th July 1996. There were two sheeps in the drama, Diana and Suzie. Diana was in the advanced stage of her natural pregnancy. A cell from her developed breast was taken out and its nucleus was removed. Suzie was a normal sheep; one of the egg cells from her body was taken out and its nucleus removed. The nucleaus from Diana's cell was implanted in the egg-cell of Suzie. Here was then a new cell with Diana's nucleus and Suzzie's cytoplasm. (Cytoplasm means the jelly-like material outside the nucleus, in any cell). The new cell was then placed in Suzie's womb. There, the baby-forming process started and after the usual period, the cell grew up to a baby, Dolly.

Although this sounds as simple as putting a coin in the pocket, the process was extremely complicated. Just to mystify you, I quote here a sentence from the first original paper published in the scientific journal, "Nature" (Vol. 385, February 27, 1997) by the team of scientists who brought Dolly on the already tortured mother-earth.

"Ultrasound scan was used for pregnancy diagnosis at around day 60 after oestrus.... Pregnant recipient ewes were monitored for nutritional status.... Signs of EAE.... And toxoplasmosis".

Don't bother if you don't understand this, for the simple reason that I don't understand a word of it, except that it appears to be in English. Idea is to show that this was not as easy as it sounded. For the team of scientists this was a successful experiment, a satisfying reward after a great amount of exertion and anxiety. They never thought, this would rock the Western World the way it did. When the team leader, I Wilmut, was informed on phone by his colleague on the spot that Dolly was just born, his response was not that jubilant. "It's bizarre but true that we didn't get lit up on the day Dolly was born," he said. "It absolutely sounds absurd now. I had actually bought some champagne" but never opened it. (Gina Kolata, a science journalist reveals this in her book, "Clone, The Road to Dolly and the Path Ahead".(Quili 1998). Gina was the first to break the news of Dolly's arrival in The New York Times and her book makes an exciting reading, informative and entertaining both).

THE FICTION PEOPLE

Much of the blame for the commotion about Dolly lies with the science fiction writers and media people, although a few eminent scientists (like Watson of DNA spiral structure) had warned the American nation against the cloning of humans. Frankenstein was created (in fiction of course) by Mary Shelly in 1818. H. G. Wells imagined a scientist who gloried in creating monsters in "The Island of Doctor Moreau" (1934). Oscar Wilde wrote "The Picture of Dorian Gray" wherein a man sold his old soul, so that he might not get old. When the scientists were attempting to clone frogs and toads in early seventies, one Williard Gaylin, a psychiatrist wrote an article in The New York Times Magazine (March 5, 1972) under the headlines "**The Frankenstein Myth Becomes a Reality: We have the Awful Knowledge to Make Exact Copies of Human Beings**". His main concern was that the then cloning experiments raised the question: whether some researches in science ought to be done at all. Should there be any moral and ethical values in trying to find out the secrets of nature

through science? So far, it had been science for science's sake, that is, a science-researcher need not bother about morals or values. "Science above morality" and "Value free science" were the proud slogans of those days. Gaylin's theme was to caution the humans that human cloning would raise tremendously complicated questions of ethics and morality and therefore should the researches be stopped?

WAS THIS TO BE THE SEARCH FOR TRUTH?

Alas! Even in 1972 it was too late to raise the question. Science had already gone a long long way in throwing all moralities to dogs. On 6th of August 1945, when the then Hiroshima was wiped off the map and tens of thousands of humans were outright killed or tortured for life, there was no doubt that the whole activity of science emanated from Satan. Where was the boasts of "Improvement of natural knowledge", the much acclaimed aim of the Royal Society of London? Where was the pompous bluster of "search after truth"? Where was the arrogant bray: "We have understood most of everything"? Think of a sea of humans burning with radioactivity lying on the banks of Hiroshima river on 6-8-1945, when the tortured living were envying the already dead. They must have bitterly cursed this monster of science. Was this the right way of arriving at the truth? Then why were there the Messengers of God, who taught the humans that the moral code for them was founded on eternal spiritual laws? And that the universe did not operate just on physical laws fumblingly found and faintly understood by science? And that you can't draw water from the well of Truth with the leaking bucket of the human mind? Science has made us forget that the hole is first to be plugged by living the life on earth as taught by God's divine Messengers.

ARE THESE THE 'GIFTS' OF SCIENCE?

And it is not merely Hiroshima. At the end of the century after 400 years of Godless exertions, what do we have? Mustard gas; germ warfare; terrorism; a hole in the ozone layer; unprecedented forests destruction and species extinction; the heavily disturbed natural cycles of food, air and water; a war between man and microbes, where microbes are admittedly wining; and above all handing over the globe to international crime gangs thriving on trafficking in drugs and nuclear technology, computer crimes, child snatching for organs; prostitution and pornography, and homosexuals demanding their alleged rights. It is too late-horribly too late to talk of 'ought' ethics and value science.

It was too late even in 1972 for Gaylin to talk of morals in science qua cloning. Yet his warnings were received by the scientific world with a stony silence. Who is going to do this useless research? - some eminent scientists thought. We are too busy with cancer control, immune process, and eradication of diseases to waste our time on producing carbon copies of humans. And here is an important relevant point : Gaylin as well as the scientific community knew that the genes of a cloned-born animal would be the same as those of the 'real' mother **but the clone would not be exactly like the original; it might even be radically different.** As Gaylin said in his article:

"Life experience pounds, pulls and shapes the same genetic clay into wondrous and ludicrous variations. **A genetic St. Francis clone could evolve into a tyrant. Or, more optimistically, a Hitler clone has the potential for sainthood.**"

This is a bit poetic but true. Remember? In the first article of this series I had told you that it is not just possible to have even one exact duplicate of Einstein or Michael (Jordan or Jackson) through cloning. **So, the problem is not to produce 100 Hitlers out of one. The real riddle is : produce without sex and more amazing: woman to produce without man, even without man's sperm! Lesbian women can have children without men. Are humans to be manufactured and marketable commodities? What about the institutions of marriage? Children? Identity? Morals? Ethics? Religion? Laws of Succession?** Above all, what is a human? A machine called clone? Has it a soul? Has Socrates famous dictum, "Know thyself" any relevance? What are these Saints and Sages and Seers and Messengers of God?.....

Before we delve into the discussions and arguments going on in the West on these heavily entangled questions, I place before you a little bit of science to show why you cant have another Hitler through cloning.

When a child is conceived in the mother's womb, the first germ cell divides into different cells with a great speed. In a week thousands of cells are formed. They travel in different directions to form different organs of the body. For instance, the cells destined to form the heart travel to the proper place and multiply there as

heart cells. So also all other organs. But the cells destined to form the nervous system behave differently. They are called neurons or nerve cells. They arrange themselves in a certain lay-out. And here is the punch line - **no two individuals walking on earth have the same lay-out not even if they are identical twins conceived at the same instant. No two brains are alike.** Neurons seem to have a will of their own. They arrange themselves in their own pattern and even change it, if the circumstances so demand. "From the very beginning, what is in the genes is different from what is in the brain.

And the gulf continues to widen as the brain matures." (**George Harrison in "Soul Searching" N. Y. Times March 2, 1997**). The twists and turns of the neuron circuit make a man what he is; and **they are different in EVERY man** and even different in the same man at different times of life. (Man includes woman). Hitler's clone may come out to be St. Francis and vice versa!

"I CANT HELP IT. IT IS IN MY GENES"

There is a belief (almost a religious belief) amongst some scientists that genes alone determine all aspects of an individual. This is known as **genetic determinism**. A homosexual person has the trait implanted in his genes, they say. He can't help it. The same would apply to any criminal. Perhaps some day a murderer's gene will be found and scientifically classified - something like "INAH". (This is actually the name of homosexual gene - roughly). The killer's defense will be: 'It is in my genes; I have constitutional right of behaving as I am induced to by the constitution of my genes; my genetic constitution is more fundamental than the constitutional chapter on fundamental rights.'

As science goes deeper, the devil becomes stronger.

There is however a contrary belief in the jungle of science. They often quarrel like religious fanatics. No doubt genes have an essential role in the behaviour of this animal, the man. However each individual is the result of a complex interaction between his or her genes and **the environment** in which he or she has grown and growing up. This argument between **genetic rigidity and environmental flexibility** is going on since the rise of the molecular genetics in this century.

(The materials in this article is taken mainly from two books: "**Clones. Facts and Fantasies About Human Cloning**" (Nortan - 1998), which is an excellent collection of about 25 articles on the various facets of cloning. The other is **Gina Kolata's** book referred earlier).

(To be Contd.)

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