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Selected Genetic Destination: The Rise of *Homo sapiens genomicus*

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Abstract: *Selected genetic destination* is a species', such as *Homo sapiens*, possessing control of the genetic evolution of a species (other species and their own species) with the use of genetic engineering techniques (Grandy 2010b). Since the completion of the human genome project in 2003 scientists and philosophers have speculated on the possibility of not only curing numerous diseases, but also the possibility to be able to enhance humans with genetic engineering (Grandy 2006c). Serious philosophical and religious debate has arisen in response to the possibility of the non-medical use of gene therapy. There is much gray area that needs to be defined when discussing what medical gene therapy and genetic enhancements are. I have proposed that the use of genetic enhancement will give rise to a new species *Homo sapiens genomicus* (Grandy 2010b). In this paper I will discuss the differences between passive human enhancement and aggressive human enhancement, the different possible subspecies (especially *Homo sapiens genomicus*) that may evolve in the future, the possibility of genetically engineering species better suited to survive in space, and reasons to support the use of genetic engineering to improve humankind. In conclusion, I will discuss where the *Homo sapiens sapiens* subspecies stands in the grand scheme of things.

Introduction

In 1953, the structure of the DNA molecule was identified (Watson and Crick 1953). Fifty years later, in 2003, the human genome project was completed (Grandy 2006c). In 1973, the first gene was removed from a frog genome and successfully inserted into the genome of an *E. coli* bacterium (Grandy 2010a). By 1978, scientists using recombinant DNA techniques; which involved inserting a human insulin producing gene into *E. coli*, produced synthetic human insulin (Grandy 2010a). This was the very first genetically engineered product made for human consumption and was approved for use by the FDA in 1982. On July 5, 1996 the world was shocked when it was announced that an actual animal, a ewe named Dolly, had been cloned.

The future is now full of speculations, hopes, and fears. The possibility to cure numerous genetic conditions and other diseases on a genetic level is now a reality with the emergence and refining of genetic engineering. However, apprehension looms and debate will explode with the possibility of applying that same technology for non-medical genetic enhancement. In addition, this technology gives humankind the possibility to select genetic information to alter or improve the destination and evolution of any species including our own. This is known as *selected genetic destination.*

If genetic modifications on *Homo sapiens sapiens* take place does that process in turn change the species or at the very least does it change the subspecies? Of course it does! The totality of any organism is the result of what the DNA molecule expresses (Grandy 2006a). The difference in

DNA is what makes a human (*Homo sapiens sapiens*) different from a chicken (*Gallus gallus domesticus*).

In this article I will discuss the following:

1. Provide a definition for and justify the term *selected genetic destination*; in addition to comparing and contrasting it to other ideas and theories about the future of human evolution.
2. Propose that genetic changes made on human beings with genetic engineering technology and selected genetic destination will give rise to a new sub-specie *Homo sapiens genomicus* or "the man with the wisdom to alter his genome". I will also justify why a subspecies is warranted, as opposed to a new species at this point. This will also require reviewing what defines a species and a subspecies.
3. Provide clarification in the grey area of what human enhancement is. In this I will classify and define passive human enhancement and aggressive human enhancement. In this discussion it will also be necessary to include a brief discussion on eugenics, euthenics, and proliferagenics.
4. Compare and contrast the concept of *Homo sapiens genomicus* with Nietzsche's "higher humans" and "overhuman", transhumans and posthumans, and H. James Birx's *Homo sapiens futurensis*.
5. Propose what other types of subspecies and species *Homo sapiens genomicus* can give rise to in the future.
6. Review common reasons why society opposes genetic human enhancements (or SGD) and also provide reasons in favor of selected genetic destination such as; in response to a failure to improve the species through natural selection, the possible need for genetic engineering for space travel, and to promote the evolution of DNA consciousness (Grandy 2010b).

At first glance this may all sound highly unrealistic and very science fiction. However, in the near future that perimeter of *unrealisticness* is rapidly collapsing and all of these possibilities are becoming an awakening reality as the technology grows. The train has not only left the station, but it is rapidly gaining blinding speed!

1. Defining and Justifying Selected Genetic Destination

The ability to create or alter genetic material with the intention to make changes in an organism's genome is **selected genetic destination (SGD).** This would be different from genetic changes due to *descent with modification*, the occurrence of mutations, environmental adaptation, or natural selection. Genetic enhancements would be considered selected genetic destination because a specific *genetic destination* is being *selected* by utilizing genetic engineering techniques. For example, the selected genetic destination of an individual to be more intelligent or disease-resistant than that individual was originally, would involve the genetic manipulation of that individual's genome. SGD is the ability to change or enhance the genome of any species and as a result this process gives humankind control over the evolution of any species including its own!

The advent of SGD will give humankind the possibility (or reality) to control the course of its evolution, which has also been called *emerging teleology* (Grandy 2010a). For example, scientist could genetically engineer gills in humans that remove oxygen from water. This would allow the ability to breathe under water. Many animals already exist that have this ability so those genes already exist and that particular genetic material is available to study. Of course this is an oversimplification of a very sophisticated scientific process. However, it does provide a basic idea of what is being implied with SGD.

In addition to applying SGD to human evolution, it can also be used to alter the evolution of other organisms. For example, research has already begun to genetically engineer plants that are more disease resistant and produce more fruition. Another possibility would be to insert genes that produce omega-3 fatty acids into pigs. I like this idea because I really like bacon. However, bacon can cause my cholesterol to be too high, which can have poor health consequences. Omega-3 fatty acids have been shown to lower cholesterol and provide cardiovascular benefits (Lavie 2009). Therefore, bacon with Omega-3 fatty acids would be an outstanding application of SGD to other animals, such as pigs!

In summary, SGD is the ability to use genetic engineering techniques to select a genetic destination of a species and have control over that species' evolution. In humans, the utilization of SGD would give rise to a new subspecies *Homo sapiens genomicus* because the genetic content of the current individual is different than the original *Homo sapiens sapiens*. I will go into the justification of why the term *Homo sapiens genomicus* should be applied in section 2 of this article.

1.1 SGD Verse Emerging Teleology

I will quickly contrast SGD and emerging teleology. Emerging teleology was mentioned in my chapter *DNA and Genetic Engineering* in the two volume reference *21st Century Anthropology* (Grandy 2010a). Emerging teleology was proposed by my early mentor James H. Birx. He proposed at *The International Conference on Humanism and Posthumanism* 2009, in Belgrade Serbia, that "man will have control over his own evolution with use of genetic engineering and nanotechnology[1]". Although this speculation is fascinating it lacks scientific substance.

SGD and emerging teleology are similar ideas but I will propose sound reasoning to replace emerging teleology with SGD. No current evidence exists proving that nanotechnology can be used to cause changes in the genome of an organism that will dictate evolution. Where as, gene therapy studies are already underway (Schulze-Tanzil 2009 & Waldner and Neurath 2009). It is more likely than not that genetic engineering will be the primary driving force behind any scientifically controlled evolution, thus emphasis must be placed on the genetic selection of a particular evolutionary destination. Nanotechnology may have a role in this process in the future but the major contributor will be genetic engineering because the genome of an organism must be altered on a genetic level.

[1] **Nanotechnology** is a technique that uses molecular recognition to create self-assembling branched DNA complexes which in turn yields the engineering of functional systems at a molecular level (Grandy 2010a).

The second difficulty with accepting emerging teleology over SGD is that Birx never made it clear what teleology was emerging or what the intermediate would be. Due to these deficiencies emerging teleology appears to be more of a scattergun theory in that it was just thrown out there as an anemic speculation. SGD on the other hand, provides an accurate method (genetic engineering), an intermediate (*Homo sapiens genomicus*), and emerging possibilities which will be discussed in detail in section 4 of this article. Consequently, SGD provides a more complete explanation of the process of humankind having the technological potential to control the evolution of its own species; as well as other species.

2. Why a Subspecies Called *Homo sapiens genomicus*?

First and foremost, allow me to mention what sub-species of *Homo sapiens* are known. Currently there are three sub-species of *Homo sapiens*; *Homo sapiens neanderthalis, Homo sapiens cromagnus*, and *Homo sapiens sapiens* (Birx 1988). There is a very small but noticeable difference between these three sub-species. An example of one of these differences is that Neanderthals have a more prominent supraorbital torus, which is characterized by an expansion of the frontal sinuses (Kreger 2006). It has been argued that if Neanderthals or Cro-Magnons walked among us today they might blend in and go unnoticed. Most of the differences are extrapolated from fossil remains of those subspecies and are morphological, e.g. stature and facial/skull structure.

When genetic engineering is performed on humans for non-medical reasons there will be an intermediate and experimental phase. During this phase genetic alterations will be made that could possibly make an individual faster, stronger, more disease-resistant, or more intelligent. In fact the possibilities are infinite! This could cause some physical changes in the species, but not enough change to mandate an entirely new species; although there will be enough change from the original organism to justify a subspecies i.e. *Homo sapiens genomicus*.

The idea of this subspecies is relatively new but was first mentioned in the *DNA and Genetic Engineering* chapter in the two volume reference journal *21st Century Anthropology* (Grandy 2010a). Now that I have began to justify that SGD will cause changes that will initially affect the classification at the level of subspecies I think it is necessary to distinguish what a species and a subspecies are, how they are defined, and how these definitions correspond in relationship to my proposal of *Homo sapiens genomicus*.

2.1 Species and Subspecies

George Gaylord Simpson (1902-1984) was one of the most influential paleontologists and he was also one of the main proponents of the *evolutionary synthesis*[2]. He provided the most accepted definition of what a species and subspecies is. These are the definitions that I will abide by. He viewed particular species not as a discrete entity, but rather as an arbitrarily

[2] The modern evolutionary synthesis was initiated by Julian Huxley (1887-1975) in his book *Evolution: The Modern Synthesis* (1942). At this time he attempted to rationalize a unification of several biological specialties e.g. genetics, systematics, morphology, cytology, botany, paleontogy, and ecology, in order to postulate a more rational account of evolution.

delineated segment of an evolving lineage. In his book *Principles of Animal Taxonomy* (1961), Simpson defined a species as "a unit that evolves separately from others and has its own evolutionary role and tendencies" (Simpson 1961).

According to Simpson, a subspecies is defined as a taxonomic subdivision of a species. The differentiation of subspecies mainly consists of an interbreeding of that population which results in genetic consistency. Factors that affect this interbreeding are usually natural selection and geographical isolation of a particular population of species. The subspecies differ from other subspecies of the same species by genetically encoded morphological, physiological characteristics, and sometimes by behavior. These are all typically a result of that subspecies evolution in a particular ecological area. Simpson also pointed out that differences between subspecies and other subspecies are adaptive (e.g. ecological distinctions of habit) and non-adaptive (e.g. irregular geographic variation with no apparent environmental correlation) (Simpson 1953).

Morphological changes in a species or subspecies happens as a result of them adapting to their environment. Genetic mutations can also take place naturally (Grandy 2006a). When a mutation in a gene takes place it can potentially provide a benefit to the organism, giving it an advantage to survive and reproduce. As these mutations and adaptations take place in a particular population they have the potential to cause the emergence of a new subspecies. Consequently, this subspecies continues to evolve and differentiate over time if this continues to take place.

The most important differentiation between subspecies of the same species is that a member of one subspecies is able to reproduce successfully with other subspecies with in the same species. For example, Cro-Magnons would be able to breed (and did) with Neanderthals. This is one of the taxonomical reasons that they are kept in the same species categorization *sapiens* and separated by subspecies due to morphological differences. However, members of two different species are incapable of successful reproduction; for example a pig and an elephant can not reproduce (*a pig and an elephant DNA just don't splice*[3]*).* In rare cases some different species can reproduce but render an infertile offspring; for example, a mule (Jenny or hinny) is the infertile offspring of a horse (or mare) and a donkey (or jackass).

2.2 Modern Ways of Establishing Subspecies Relationships

In discussing what defines species and subspecies, I deem it necessary to briefly mention some traditional and modern approaches to classification. Traditionally species have been grouped taxonomically according to similarities in morphology. Carolus Linnaeus (1707-1778) was the first to establish this system, which is still used today. This system is used to extrapolate the relationships of species and categorize them into kingdoms, phyla, classes, orders, families, genus, species, and subspecies. However, with the emergence of new DNA technology, genetic relationships can be more accurately assessed based on the genetic content of a species.

[3] In reference to South Park episode 105: An Elephant Makes Love to a Pig.

In 2000, J.W. Thornton and R. DeSalle proposed the relationship between gene family evolution and genetic homology (Thornton and DeSalle 2000). They stated that with the advent of *high-throughput DNA sequencing and whole-genome analysis*, it has become clear that the coding portions of the genome are organized hierarchically in what are known as *gene families* and *superfamilies*. They also made the distinction that because the hierarchy of genes reflects an ancient and continuing process of gene duplication and divergence that many of the conceptual and analytical tools used in phylogenetic systematics can and should be used in comparative genomics. They also showed how the phylogenetic approach makes novel kinds of comparative analysis possible including; the detection of domain shuffling and lateral gene transfer, reconstruction of the evolutionary diversification of gene families, tracing of evolutionary change in protein function at the amino acid level, and prediction of structure-function relationships.

Carolus Linnaeus's taxonomical system is still used and it is very important in classifying organisms. However, in the future more emphasis may be placed on genetic relationships that will be established with whole genome comparative analysis to fine tune phylogenetic systematics. This may also be important in establishing the relationship with *Homo sapiens genomicus* to future species as well as our own because scientists will be creating genetic changes in these species.

2.3 The Subspecies *Homo sapiens genomicus*

Now that I have made it clear, from a physiological and evolutionary stand point, what makes a species a species, and what make a subspecies a subspecies, what does this all mean in terms of *Homo sapiens genomicus*? It means that when medical or non-medical genetic changes (two forms of selected genetic destination) are made in the *Homo sapiens sapiens* subspecies that the newly selected genetic destination will as a result supersede the genetic ability (or genetic baseline) of the original subspecies. These changes may provide new physiological characteristics or enhancements of preexisting abilities and these new abilities/enhancements may be outside the standards (which are not fixed) of the original subspecies *Homo sapiens sapiens*. Therefore, because these physiological characteristics are different from the original subspecies a new subspecies is justified. More importantly, these genetic changes may cause changes in morphology e.g. bigger skulls for bigger brains and increases in stature. These morphological changes would also warrant a new subspecies; just as morphological differences are seen in the *Homo sapiens* subspecies *neanderthalis*, *cromagnus*, and *sapiens*. Because these changes were brought about by the process of SGD the subspecies *genomicus* would make sense.

The possibility of morphological changes is a definite reality. This is based on the science that genes interact with each other. Therefore, by adding genetic material to a genome, epigenetic cascades would likely occur. This could, as a consequence, cause additional morphological changes. It is also important to note that this could create many physiological challenges, which is discussed in section 6.3.

Homo sapiens genomicus would remain in the species as another subspecies because this subspecies would in theory still be able to reproduce with *Homo sapiens sapiens*, which is one of the conditions that characterize a subspecies in a species group. Thus, until enough genetic

engineering is done on *Homo sapiens genomicus* that it loses the ability to reproduce with *Homo sapiens sapiens* or this process starts to render infertile offspring, a subspecies status must be maintained as opposed to a new species. In the future, enough genetic change may be made that these criteria are broken. At that point a change in species e.g. *Homo genomicus genomicus* or some term more fitting to that situation when it arises would be justified.

It can be argued that *Homo sapiens genomicus* may not have been able to reproduce with Cro-Magnons or Neanderthals and as a result belong in a separate species. This is a moot argument because the two other subspecies in question are extinct and not available to reproduce. In addition, *Homo sapiens sapiens* would bear the same burden of proof. Therefore, at this juncture, there are more arguments supporting a subspecies called *Homo sapiens genomicus* as a result of SDG as opposed to labeling a completely new species.

2.4 Does Gene Therapy for Medical Reasons Justify *Homo sapiens genomicus*?

I have established that the use of SGD for non-medical genetic enhancements would give rise to a new subspecies *Homo sapiens genomicus*. However, the question may arise "does gene therapy for medical reasons give rise to a *Homo sapiens genomicus*?" The answer would have to be *yes* only if new genetic material is added. However, if a defective gene, caused by a mutation, is merely being corrected, then *no*, this process should not give rise to *Homo sapiens genomicus*; it merely is an attempt to repair the existing genome of *Homo sapiens sapiens* and no new genes are added.

Some bioethicists, such as Ronald Lindsay, question if a line can be drawn between therapy and enhancement (Lindsay 2008). One should be inclined to agree because the only difference is the subjective intention. However, the actual processes are very similar. I will address this issue in more detail in section 3.

According to this proposal, any intentional alteration in the genome as a result of genetic engineering and SGD on *Homo sapiens sapiens* would translate to *Homo sapiens genomicus*. This is because there is now an intentional alteration in the genome from the original version, regardless if the reason was for medical or non-medical/SGD reasons. Therefore, genetic therapies that add additional genetic material into the patient's genome equals an enrollment into the new subspecies *Homo sapiens genomicus* just as non-medical SGD would, but again only if new genetic material is added. However, if a genetic mutation is being corrected and no extra genetic material is being added then this enrollment should not apply.

It is important to remember that an organism is the totality of its genetic expression. Genetic changes can happen naturally by mutations and those changes can be perpetuated by natural selection (Grandy 2006a). The smallest change in an organism's genome in any given environment has the potential of giving rise to a new subspecies. Therefore, in an attempt to be consistent, any intentional genetic change made using genetic engineering, gene therapy, or SGD on *Homo sapiens sapiens* should constitute *Homo sapiens genomicus*. The gray area is when a defective gene is being corrected by means of gene therapy as opposed to an intentional enhancement of the genetic baseline.

2.4.1 Arguments Against Medical Gene Therapy Being Considered Enhancement

The argument may be proposed that the gene therapy performed on a particular *Homo sapiens sapiens* for medical purposes did not elevate that individual's ability outside the capacity of the species (or subspecies). Many support that this should not count as an enhancement. This argument was discussed in the U.S. National Science Foundation's *Ethics of Human Enhancement* (Allhoff, Lin, Moor, and Weckert 2009). This brings us to evaluate the use of the word *enhancement*.

The term *human enhancement* is regarded as boosting capabilities beyond the species-typical level or statistically-normal range of functioning. This, as proposed by U.S. National Science Foundation's *Ethics of Human Enhancement*, is different from *therapy*, which is aimed at treating pathologies that compromise an individual's health and would also reduce that functioning below the species typical level. However, they did not address the issue that the individual's genetic baseline has been changed as a result of this process.

I think this can be confusing criteria mainly because species-typical levels and statistically-normal ranges are not fixed values. They can change over time depending on the demand of the environment. Species can evolve over the course of time and exceed those species-typical levels and statistically-normal ranges, while maintaining their speciation (or sub-speciation). Alternatively, they can evolve into a different species (or subspecies). In fact, both of these situations have happened often throughout time, but have never been considered an enhancement when it does. It is usually referred to as evolution. In fact, athletes spend their lives trying to exceed statistically-normal ranges through training and competition.

Another objection to the idea of species-typical levels and statistically-normal ranges being fixed is the occurrence of genetic mutations. If a particular mutation gives an individual organism a boost in a particular ability compared to other individuals in his species, then he is better suited to survive. That individual now has an advantage but he was not enhanced, even though his mutation allowed him to exceed the current species-typical levels and statistically-normal ranges. If that individual survives and reproduces, then that individual can perpetuate that new trait for several generations. If this took place then there would be several individuals that exceed the species-typical levels and statistically-normal ranges. Consequently, the species-typical levels and statistically-normal ranges have now been changed and can change again. However, this is not considered an enhancement because SGD was not use, but a genetic change was made as a result of a mutation.

Genetic enhancements should be considered an increase in function compared to the individual's original functioning or genetic baseline due to SGD. Genetic enhancements should not be defined by species-typical levels and statistically-normal ranges because they are poor measuring devices and are not fixed values. It makes more scientific sense to place the emphasis of defining genetic enhancements based on genetic baselines of an individual. Thus the addition of genetic material into a genome for medical and non-medical reasons should be considered an enhancement and SGD, which places this individual into the subspecies of *Homo sapiens genomicus*.

At this juncture I have tried to distinguish differences between genetic enhancement and genetic therapy, which I proposed that there is no difference and that they are both one in the same. However, I think it is also prudent to also recognize the similarities between genetic enhancement and genetic therapy because those similarities serve to solidify that they are the same thing. The strongest similarity between the process of genetic enhancement and gene therapy is that a physiological difference was made at the genetic level that was not originally present. This genetic change causes a change in the function of the original individual's biologic system; enhancement is considered an intentional elevation in function and genetic therapy is an attempt to attain the subjective median of function with in a species. These two processes are exactly the same regardless of their intention, which I believe that I have proven beyond a reasonable doubt.

In conclusion, the term human enhancement could be defined as an increase in an individual's functioning that is outside the limit of that individual's original level of genetic functioning i.e. a change in the genetic baseline. This should include genetic therapy (if new genetic material is being added but not if a mutation is being corrected) because during this process a change has been made on a genetic level that allowed the individual to exceed its previous level of functioning and original genetic baseline. Genetic enhancement is SGD and should not be characterized by the species-typical levels and statistically-normal ranges because those levels and ranges are not fixed and can change over time. Therefore, any addition of DNA to *Homo sapiens sapiens* would give rise to *Homo sapiens genomicus*. However different types of SGD need to be delineated because there is much gray area. In the next section I will attempt to make a distinction between two types of SGD called *passive human enhancement* and *aggressive human enhancement*.

3. Passive Human Enhancement and Aggressive Human Enhancement

Currently, there are poorly established criteria for the definition of *human enhancement*. I have already established that genetic enhancement and genetic therapy are the same process and differ in only the intention. However, the generalization of the phrase human enhancement needs more accurate categorizations. I will now propose and support that enhancements should be separated as two types of SGD; passive human enhancement and aggressive human enhancement.

3.1 Passive Human Enhancement

Passive human enhancement should be defined as an attempt to provide and obtain a median of functioning within the existing genome of an organism using SGD or gene therapy. This enhancement does not allow that individual to exceed the functioning of the trait being corrected, but rather to attain functioning within the current subjective median. Again, I am trying not to employ the terms species-typical levels and statistically-normal ranges because they are not fixed and they can change over time; whereas the *current subjective median* is what is currently agreed to be an acceptable level of functioning. Therefore, passive human enhancement can be viewed as an attempt; typically medical, to correct an obvious defect with SGD in order to obtain a

subjective median of functioning, but does not have the *intention* of exceeding any currently established limits of a trait.

In addition to medical genetic therapy, other examples of passive human enhancement would include; eye glasses, education, vaccinations, medical pharmacological therapy, and to an extent resuscitation. These are all attempts to provide an individual the ability to maintain and enhance the limits of his own genome or genetic baseline, but not to exceed the subjectively established limits of the species population. For example, eye glasses help a person read, but not to see through walls. Another example, hypertensive medication is used to reduce blood pressure to a normal range to reduce heart attack or stroke, but not to provide superhuman abilities. Therefore, these types of human enhancements should be deemed passive human enhancement because the intention is to place the individual's functioning within the currently accepted subjective median of functioning.

Next I will need to provide a very specific and technical example in order to illustrate the use of passive human enhancement, a form of SGD, in the context of current medical therapy. I understand this is a generalized discussion so I will explain the technical jargon along the way.

An example of SGD being implemented as passive human enhancement would be the use of immunomodulatory gene therapy to enhance the efficacy of enzyme therapy in Pompe disease and other lysosomal storage disorders (Koeberl, Kishnani, and Priya 2009). Pompe disease, also known as acid maltase deficiency (AMD), is classified as an autosomal recessive genetic disorder, which is caused by a deficiency or dysfunction of the enzyme lysosomal hydrolase acid alpha-glucosidase (GAA). This enzymatic defect results in lysosomal[4] glycogen accumulation in multiple tissues, such as cardiac and skeletal muscle tissues, which has pathologic consequences. This type of gene therapy aims at decreasing the T-cell mediated immune response to enzyme replacement therapy which is typically used for this genetic disorder.

In this example, a patient is attempting to correct an inherited genetic disorder that impairs his or her level of functioning with gene therapy (or more specifically immunomodulatory). This individual is not trying to boost any of their abilities or traits. Rather, they are merely attempting to attain a selected genetic median of functioning and to avoid any adverse pathological consequences of their defective GAA enzyme. However, genetic material (in this type of therapy is called a cassette) is being adding to their genome; in this case to decrease the immune response to enzyme replacement therapy, which as a consequence is enhancing their normal genetic baseline. Therefore, a selected genetic destination is chosen and the therapeutic method is implemented, which is passive human enhancement.

3.2 Aggressive Human Enhancement

Aggressive human enhancement should be defined as using SGD in an attempt to make genetic alterations to a genome that would intentionally provide an individual with abilities above that of

[4] Lysosomes are organelles with in a cell that breaks down glycogen using the enzyme GAA. When glycogen is not broken down it accumulates in the lysosome and causes it to expand and eventually to leak out, which causes an impairment of tissue function.

the current established subjective median of functioning for that species or subspecies. As with passive human enhancements, I will avoid using species-typical levels and statistically-normal ranges because they are not fixed values. Therefore, this form of SGD can be considered aggressive human enhancement because the underlying *intention* is to boost the abilities beyond that of the typical *Homo sapiens sapiens* and to exceed the current subjective median. Consequently, this is another reason to enforce the notion that a new subspecies *Homo sapiens genomicus* needs to be used when aggressive human enhancement is performed because the intention is to go beyond the established limits.

Earlier I provided an example about making genetic alterations to humans to allow them to survive underwater for prolonged periods of time. This is an obvious example of aggressive human enhancement, despite the fact that it is merely speculation at this point. I will provide other examples later, but at this juncture I believe that I have made a clear enough distinction between what passive human enhancements and aggressive human enhancements are. Eventually sub-categorizations of the passive and aggressive distinctions maybe necessary as genetic engineering and SGD are bound to create more gray area in the future.

3.3 Proliferagenics: Where Does SGD Fit in?

The concept of *proliferagenics* was proposed as the utilization of both eugenics and euthenics to improve an organism's genome as well as the well-being of a species (Grandy 2010a). Proliferagenics focuses on improving pre-genetic natural selection (or better breeding) and then applying post-genetic euthenics to maximize the vitality of a species' genome i.e. the best of both worlds. In that article, I also differentiated between positive and negative eugenics, as well as between positive and negative euthenics. I will further define these terms and briefly discuss how they apply to SGD and the rise of *Homo sapiens genomicus*.

Eugenics is defined as the use of pre-genetic measures, such as selective breeding, to make improvements or to encourage desired traits in the genetic characteristics of a population (Grandy 2010a). The word eugenics was originated by Sir Francis Galton (1822-1911) and first appeared in his book *Hereditary Genius* (1869). The term eugenics, or "good genes", was later broken down into positive and negative eugenics. Positive eugenics is the encouragement of individuals within a population, with desirable and beneficial characteristics, to propagate through breeding. This is commonly done with show dogs and racing horses. Conversely, negative eugenics is the discouragement or intentional prevention of the procreation of individuals in a population with undesirable or subjective non-beneficial characteristics. Types of discouragement can include sterilization, abortion, and castration.

Euthenics is the improvement of an individuals (or organism's) functioning, efficiency, and well-being by modifying environmental factors that are controllable (Grandy 2006b, Grandy 2010a). Examples of controllable environmental factors are living conditions, medical treatment, and education. The word euthenics was first mentioned by Ellen Swallow Richards in her book *The Cost of Shelter* (1905). Richards used the word euthenics to mean "efficient living". Following the model of eugenics, I have broken down euthenics into two categories of positive and negative

euthenics (Grandy 2010a). Positive euthenics is defined as proactive methods of improving an individual's quality of life after birth has taken place. Examples of positive euthenics would be vaccinating against debilitating diseases and the potential use of SGD to correct genetically inherited diseases. Conversely, negative euthenics is the intentional or unintentional degradation of controllable conditions that subjects a population to a poorer quality of life. Examples of negative euthenics would be pollution, overpopulation, lack of education, lack of access to medical treatment, and disproportionate distribution of vital resources.

Essentially euthenics differs from eugenics in that the focus of improving the individual is done after birth has already occurred. This is different than eugenics which strives to improve the probability of giving birth to an individual with desired genetics through selective breeding. Note that positive and negative euthenics affects an organism after it has been born and does not focus on selective breeding or the discouragement of two individuals breeding together. Another way of looking at this is that eugenics is a pre-genetic attempt to improve an organism's genome while euthenics is a post-genetic strategy to improve an organism's well being.

The concept of proliferagenics focuses on both improving pre-genetic natural selection strategies (eugenics) and then applying post-genetic euthenics to maximize the vitality of a species' genome. Therefore, proliferagenics would entail breeding more prudently and then making post-genetic improvements as seen fit. Consequently, proliferagenics would be capable of utilizing both types of SGD; passive and aggressive human enhancement.

Now that I have defined eugenics, euthenics, and proliferagenics I will now attempt to determine where they fit in relation to passive and aggressive human enhancement. The problem with making this determination is that euthenics and eugenics predate the genomic era. Proliferagenics on the other hand was defined in the post genomic era.

Passive human enhancement should fall under the domain of positive euthenics. The primary reason for this is because passive human enhancements aim at improving the quality of an individual's functioning, but not exceeding the typical limits of functioning. However, exceeding limits is not completely addressed in euthenics. To an extent euthenics can be seen as a way of improving a species that may eventually contribute to the superseding of a species limits. The initial goal of positive euthenics is to improve the quality and well being of an individual, not to exceed established limits. Thus, the initial intent of euthenics is independent of the potential outcome when making the correlation between positive euthenics and passive human enhancement. The second reason that passive human enhancement should be considered a form of positive euthenics is because the improvements are being made after birth has taken place, or post-genetically.

Aggressive human enhancement is obviously outside the realms of eugenics and euthenics. As I mentioned before, this is mostly because the definition of eugenics and euthenics predate aggressive human enhancement. In addition, eugenics traditionally implements pre-genetic strategies and euthenics emphasis is on improving post-genetically. It is assumed that euthenics intention is not exceeding a species current subjective median of functioning. However, aggressive human enhancement can be easily incorporated into proliferagenics. Therefore, a comprehensive definition of proliferagenics would be the implementation of euthenics and

eugenics, as well as the potential utilization of aggressive human enhancement to not only improve the functioning of a species, but to exceed the species current subjective median of functioning or upgrading the original genetic baseline. The later part of this definition differs from my original definition of proliferagenics, which is defined in chapter "DNA and Genetic Engineering" in *21st Century Anthropology* (Grandy 2010a).

4. What Could *Homo sapiens genomicus* Give Rise To?

I have already proposed that SGD will initially change *Homo sapiens sapiens* at the level of subspecies giving rise to a new subspecies *Homo sapiens genomicus*. However, with this degree of technology potentially at humankind's disposal, what could *Homo sapiens genomicus* give rise to in the future? With the advent of SGD the possibilities are endless! It is possible that the technology provided by genetic engineering could allow scientists to make genetic alteration(s) that would improve human immune systems to allow better toleration of robotic implants and computer microchips. This technology would in turn evolve *Homo sapiens genomicus* into *Homo sapiens roboticus* or "man with robotic implantations". Again, it is reasonable to justify a change in subspecies; as opposed to the species, because not enough change has been made genetically to justify a change in species, but obvious morphological changes have been made. In addition, the ability to reproduce with the other subspecies must be present. If the ability to reproduce with other subspecies is lost, then a change in species would be justified.

The argument may ensue that there are obvious morphological differences in *Homo sapiens roboticus*. However, those are artificially implanted into a *Homo sapiens genomicus*, whose genome was altered to better tolerate these implants, and those implants can not be inherited. *Homo roboticus* or *Cyborgs* have been proposed in the past, but the creation of a separate species would have to exist outside the previously established conditions that define species and subspecies, which I have already discussed.

In the following sections I will mention a few more examples of other subspecies (and eventually new species) that may evolve from *Homo sapiens genomicus*. This is important because I want to make it clear that *Homo sapiens genomicus* is not the end or the replacement of *Homo sapiens sapiens* and not the long term goal of SGD, rather it is the possible link to a multitude of possibilities of future evolution, not teleological endpoint.

Earlier I mentioned the possibility of genetically engineering gills and inserting them in to the human genome, or reactivating dormant genes that may exist in our introns[5]. Theoretically, humans with these *genetically engineered gills* would be able to live underwater for prolonged periods of time. This could be an option to eliminate overpopulation on land. Initially, this organism would be *Homo sapiens genomicus* because an alteration to the genome was made using SGD. However, after a period of time, living under water may cause other physiological changes, advantageous mutations may occur, and adaptations could occur to this particular *Homo*

[5] Introns are non-coding portions of DNA, which is different from exons that are coding portions of the DNA (Grandy 2010a). For a more detailed explanation of their functions please consult the reference.

sapiens genomicus. Consequently, this population of *Homo sapiens genomicus* could evolve into something else; e.g. *Homo sapiens amphibious* (if they can survive on land and water) or *Homo sapiens aquaticus* (if they evolve to only survive underwater). The declension of subspecies would remain until the termination of the subspecies conditions were rendered ineffective. Once again, this may sound science fiction, but it is a serious possibility in the future.

The opportunity to travel for prolonged periods of time in space in search of other habitable planets is on the horizon. This would require a new discipline of medicine called *space medicine* (Grandy 2009b). Space medicine would be the specialty to address the potential encounter of possible extraterrestrial microorganisms, hazardous effects of space (e.g. radiation), hazardous effects of other planets atmospheres, the possible side effects of suspended hibernation, and the deleterious mutations that can occur as a result of space exposure. Ultimately, the specialty of space medicine would have to incorporate SGD.

SGD could be used to provide modifications that allow humans to survive for prolonged travels in suspended hibernation and to survive on other planets. The *Homo sapiens genomicus* populations that are genetically engineered to survive on other planets would undergo similar changes that our underwater model would undergo. This could give rise to *Homo sapiens extraterrestralis*. I had addressed this possibility in 2009 in my article "History of Medicine" (Grandy 2009b). This process of SGD and space travel could give rise to many other subspecies or eventually new species that would eventually make adaptations to their new environments and/or undergo mutations in space or on other planets. Therefore, *Homo sapiens extraterrestralis*, like *Homo sapiens genomicus*, could be a transgenic intermediate to the emergence of other subspecies and species.

In conclusion I would like to make it clear that *Homo sapiens genomicus* is not an end point, rather it is a juncture at which many other subspecies, and eventually new species, can evolve from in the future with the application of SGD. I have discussed the possibilities of *Homo sapiens roboticus*, *Homo sapiens amphibious*, *Homo sapiens aquaticus*, and *Homo sapiens extraterrestralis*. The simple fact of the matter is that when the science of SGD is perfected the possibilities are endless!

4.1 How close are we to *Homo sapiens genomicus?*

This is an obvious question that is inevitable going to arise. Of course several passive human enhancements are currently being used for medical therapy. The strong argument is that aggressive human enhancement is still far away from becoming a reality. This is mostly grounded in the fact that the genetic interactions of the human genome are extremely complicated. However, at the rate at which technology has exploded in the past 20 years, it would not be a high risk wager to bet that some forms of aggressive human enhancements will be at least testable in the next 20 or 30 years; or perhaps sooner. Therefore, many of us may live long enough to meet or become a *Homo sapiens genomicus.*

Interestingly enough, humankind's future and potential next step in evolution has been speculated upon before this. In the case of Fredrick Nietzsche, the speculation on future humans took place more than a half of a century before the DNA molecule was even discovered. Next, I

will discuss some views on "future humans" and "posthumanism" and provide arguments to support my model of SDG and *Homo sapiens genomicus* as a more complete theory for the future of human evolution.

5. Nietzsche's Higher Humans and Overhumans, Transhumans and Posthumans, *Homo sapiens futurensis,* and *Homo sapiens genomicus*: What are the Differences and Similarities?

Many ideas and theories exist regarding what humans in the future may be like. German philosopher Fredrick Nietzsche (1844-1900) proposed the emergence of "higher humans", who would then give rise to the "overhumans". The term *overhuman* was originally misinterpreted as *overman* from the German word *Ubermensch.* However, *Ubermensch* applies to both sexes (Sorgner 2009). Thus *overman* would not be correct and *overhuman* is more accurate as it applies to both sexes. Thus according to Nietzsche's model, humans would give rise to higher humans, and then higher humans would give rise to overhumans.

Another school of thought that is similar to but slightly different from Nietzsche's concept of higher humans and overhumans is the idea of transhumanism and posthumanism. Transhumanism is a dynamic philosophy that is intended to evolve as new information becomes available or challenges emerge (Bostrom 2001). A transhuman is a "transitional human" whom by virtue of their technology usage, cultural values, and lifestyle constitutes an evolutionary link to the coming era of posthumanism (Bostrom 2005). According to this school of thought, transhumans still belong to the species of human beings. A posthuman is what comes after humans. Posthumanism proposes that posthumans will have capabilities far beyond those of humans (or mortal men) and constitute the next step in evolution.

There are some similarities between the Nietzsche view of higher humans and the transhumanist view, in that the human being is viewed as not being eternally fixed, but rather a work in progress. The transhuman is similar to the higher man in that they both are an improved version of the original human form. Both are also anticipated to give rise to something beyond the human. The transhuman gives rise to or is the link to the posthuman and the higher man gives rise to the overhuman.

Both Nietzsche's and the transhuman/posthuman view propose a *linear view* with a dead end i.e. point A (humans) becomes point B (higher humans or transhumans), and they finally transform into point C (the overhuman or posthuman). Neither view allows point B to go anywhere but one place, point C, and both views do not speculate past point C. In addition, neither philosophy clarifies a direct mechanism that causes this change to take place. Nietzsche implies that the *will to power* is responsible. Supporters of posthumanism propose technological symbiosis and genetic engineering as some possibilities.

I propose that *Homo sapiens sapiens* undergoes SGD and becomes a new subspecies *Homo sapiens genomicus,* or my point B. However, *Homo sapiens genomicus* then has the potential to become many other things that can further evolve as time goes on (points C, D, E, F, and beyond), which I have already discussed previously. This model is a *branched view* with infinite

possibilities. In addition, a direct mechanism is indicated i.e. SGD. In addition, a biological taxonomic declension is derived i.e. *Homo sapiens genomicus*, which is not an end or a point C, but rather it is a transgenic intermediate in which many other subspecies and species may emerge out of.

In 1988, H. James Birx proposed *Homo sapiens futurensis*, who would have "godlike powers" and would "usher in a bold new era with spectacular breakthroughs in art, law, science, medicine, technology, and mathematics" (Birx 1988). However, he did not go into specifics[6] as to how this process may occur and it is unclear as to whether this is merely just a frivolous speculation on his part. I think that the use of the term *futurensis* as a species or subspecies should be avoided at all cost because unless humankind becomes extinct there will always be a "man of the future". Secondly, what would come after *futurensis*? As with Nietzsche's and the transhuman/posthumanism models, Birx's *Homo sapiens futurensis* is a linear view with a dead end and no clear scientific mechanism provided for it's emergence.

In summary, I must once again proclaim that the process of SGD and the emergence of *Homo sapiens genomicus* provides a more scientific and realistic model to account for the future evolution of our species than Nietzsche's model or the transhumanism/posthumanism model. This is primarily because SGD provides a mechanism to account for these changes that can take place. In addition, *Homo sapiens genomicus* is not the end or goal, rather it is just an intermediate for many other possibilities to evolve from i.e. it is a branched view as opposed to a linear view. A branched view reflects how evolution actually occurs in nature; it is a tree or a bush, not a line. *Homo sapiens futurensis* is poor terminology, lacks a well thought out mechanism, lacks a testable model, and appears to be a frivolous speculation. Next, I will discuss reasons against and reasons to support genetic engineering and SGD.

6. Reasons Against Genetic Engineering and SGD

There are many reasons that people are opposed to genetic engineering. Religion is a major reason that some people are opposed to SGD. This is because in most religions it is believed that humans are a divide creation and that making genetic alterations are a perversion and an offense to their God. Also, for those same reasons, there is an objection to scientists playing God. However, there are several other important reasons that people will be opposed to SGD which I will briefly discuss: humankinds desire to preserve the ideas of uniqueness and talent, the fear of genobility and supermen, and the scientific reason that scientists do not yet understand enough about the DNA molecule to pursue SGD.

6.1 Uniqueness and Talent

There is also concern that humankind's notions of uniqueness and talent would lose their value. If anyone could undergo SGD and become more intelligent or receive a better memory, then people who were born a genius or with a photographic memory would no longer be special. What about musicians and athletes? If anyone could get the SGD procedure to develop superior coordination for playing an instrument or to receive superior speed and strength to exceed at

[6] He did propose *emerging teleology* about 20 years later but this speculation was dismissed at the beginning of this paper and justification was provided for replacing it with SGD.

sports, then people born with "natural talent" and "athletic prowess" would cease to be special. What about the individuals that practice and dedicate countless ours to their craft? All that work is meaningless if someone could obtain the same results from an enhancement. In fact the reason we marvel at the work of a genius in science, the skill of a great musician, or the perfect touchdown passes thrown by Peyton Manning is because they are special accomplishments that not just anyone can do. Would SGD cheapen this? No, and I will tell you why.

In some humans there is an internal drive and not everyone has the same degree of motivation. Aristotle proposed that *entelechy* was the manner in which an organism inherits and expresses its traits which is determined by a "vital inter force" (Grandy 2010a). There is also the Greek's notion of *arête,* which means excellence or fulfilling one's potential. Of course these "forces" and notions were conceived before the DNA molecule was discovered. The point is, there is something extra in the genes, in the DNA molecule, a form of consciousness (Grandy 2006a, Grandy 2010b). Of course I do not wish to imply *vitalism*. However, we all know that there is more to it than just genetics. Some athletes succeed in sports despite being shorter or being a half of a second slower than "the top of the draft". This is because they work harder, have more fortitude, desire, and more motivation.

Nietzsche was a vitalist[7] and proposed that there is a will that propels us to overcome and succeed. He also proposed that there is a "will to power"[8]. I will discuss in section 7.3 that there is a will in the DNA molecule called DNA consciousness (Grandy 2010a), which has given rise to neurological consciousness in order to develop technology in order to perfect it's self through humankind! Although I try to avoid being a vitalist, my theory of DNA consciousness may push me into that category, or at least into a tri-hybrid category of *materialist-reductionist-vitalist*. This theory of DNA consciousness is similar to Nietzsche's will to power, but Nietzsche did not have the discovery of the DNA molecule, the completion of the human genome project, or modern quantum physic at his disposal.

The bottom line is that merely receiving an aggressive human enhancement e.g. to become more intelligent does not guarantee success. We all know a lazy smart person that underachieves despite having obviously high intelligence, in fact I know a guy like that! For example, if you were to give ten individuals the same exact aggressive human enhancement that would entail inducing genes to increase intelligence all ten of them would not all be the same. Some would be more successful and some would not for three reasons. First, some would work harder or study harder, and some may not. This is the drive and motivation that I mentioned previously. Second, individuals would receive an aggressive human enhancement in addition too what they inherited for other characteristics. So one or two of the ten many become more successful because of other genes that they possess in addition to the aggressive human enhancement.

[7] A vitalist observes the doctrine that the functioning of an organism is due to a vital principle distinct from just merely biochemical reactions i.e. there is something extra.

[8] For an excellent interpretation of what Nietzsche means by *will* and *will to power* consult Stefan Sorgner's *Metaphysics without Truth: On the Importance of Consistency within Nietzsche's Philosophy* (2007). Marquette University Press, Milwaukee, Wisconsin, USA.

Third, genes interact with each other and the environment in ways we do not understand (see section 6.3). This opens many variables.

Therefore SGD would not cheapen talent and uniqueness because an individual has to still work with what was given to him in addition to the enhancements. However, SGD would change the value of what is inherited naturally verse what is obtained with genetic engineering. This is a highly charged issue and I have by no means addressed it in its entirety, but the major point had been discussed as to why some individuals may oppose SGD.

6.2 Genobility and Supermen

The concept of *genobility* and the fear of supermen are other reasons that SGD would be opposed by some. Genobility was a term that Maxwell Mehlman used in his book *Wondergenes* (Maxwell 2003). His term genobility was used to describe a caste of enhanced humans that germinated from the wealthy portion of the population that could afford genetic enhancements. He proposed that with this advantage that they would be able to continue to rule over the non-genetically enhanced portion of the population. This implies that there would be an unjust availability of SGD to the entire population, which was also discussed as a concern by Ronald Lindsay in is book *Future Bioethics* (Lindsay 2008).

There is also concern of the military developing genetically engineered "super soldiers" or supermen that would be far superior to non-genetically enhanced humans and could be use to enslave (or exterminate) the non-enhanced population. This again upsets our self entitled notion of being special and holding a special place in the universe (I will address this notion with brutal honesty in section 7.4). It is also upsetting for some to ponder the fact that we could be so easily replaced or regarded as inferior.

So far the reasons oppose SGD that I have discussed revolve around subjective notions of religion, humankind's value on talent, and concerns threatening our special place in the universe. However, in section 7 I will address more important reasons to support SGD, but perhaps to delay its use until more is known about genes, the inter-workings of the genome, and the DNA molecule. This is not only due to the fact that aggressive human enhancements are still decades away; maybe more depending on government restrictions on research, but also because much is still unknown about the DNA molecule.

6.3 Do Scientists Know What They are Doing?

Some of us may live to see aggressive human enhancements in our life time. Most of us will see many passive human enhancements used for medical treatment in our lifetime (I provided a current example in section 3.1). Both of these of course will give rise to *Homo sapiens genomicus*. However, scientists are still currently unraveling the mysteries of the DNA molecule and the human genome project (Grandy 2006a and Grandy 2006c). Do they really know what they are doing?

There is a possibility that manipulating the human genome too much could cause adverse genetic and epigenetic responses to occur. For example, an alteration of one family of genes or the

addition of new genes could cause the transcription of proteins to increase strength and increase longevity. However, some of those genetic changes could cause other dormant genes to become active or inactivate active genes. This could cause detrimental effects on other systems of the human body, depending on what other genes are affective. In addition, long term adverse effects, like new types of cancers, may take place. Therefore, SGD, passive and aggressive, should be approached with extreme caution!

7. Reasons to Support Genetic Engineering and SGD

There are many opposed to non-medical genetic enhancements; or what I have termed aggressive human enhancements. There are also some that are opposed to medical gene therapy; or what I have termed passive human enhancement. However, I will propose many sound reasons to support passive and aggressive human enhancements. Some of these viewpoints may be controversial, but I will strive to support these opinions with logic and scientific reason, as opposed to emotion and religious objection. The reasons that I propose to support passive and aggressive human enhancements is that they are now required because there is a failure to improve the species [our species] through natural selection, these enhancements may be needed for space travel, the evolution of DNA consciousness, and perhaps because *Homo sapiens sapiens* needs the competition.

7.1 Failure to Improve the Species through Natural Selection

Natural selection has been nature's way of genetically improving species and providing a means to adapt to any new environmental changes throughout time. In this process stronger individuals reproduce more frequently and weaker individuals simply do not survive long enough to reproduce or if they did reproduce, their offspring had a higher chance of being weak and did not survive long enough to reproduce. This promotes the survival of genetics that are more successful in that particular environment i.e. Darwin's *survival of the fittest*. However, this is no longer true with modern *Homo sapiens sapiens*.

Modern *Homo sapiens sapiens*es do not have many predators. In fact, the few we have are microscopic organisms and each other. Because of technological advances in medicine and general human compassion, individuals with less favorable genetics are able to survive, reproduce, and perpetuate their genes. This has caused a decline in the quality of the gene pool known as *failure to improve the species through natural selection* (Grandy 2009a). Examples of this include; increases in some genetically inherited diseases or disorders that are correlated with a strong family history e.g. diabetes, coronary artery disease, cystic fibrosis, some seizure disorders, mental retardation, and some mood disorders.

The failure to improve the species has taken place because natural selection, to an extent, has been eliminated or at the very least critically impaired. In fact, in these modern times almost any person can survive regardless of what genomic abnormalities are present, and they can easily pass those genes onto future generations. I am not implying that there are ethical grounds to deny those individuals the right to reproduce, but merely pointing out that the current system is clearly not functioning to improve the genetic status of *Homo sapiens sapiens*.

Eugenics (or prudent breeding) is no longer utilized for the most part. Euthenics is used to an extent in some modern countries but has not maximized its potential benefits (Grandy 2006b). Proliferagenics is a new theory of improving the species but is not practiced anywhere (Grandy 2010a). So how is it possible to improve the human genome now that natural selection has been so incapacitated? A prudent response to the failure to improve the species (or in this case the subspecies) through natural selection would be to utilize genetic engineering i.e. to take scientific control of our species evolution, and to chose a selected genetic destination. This would allow *Homo sapiens sapiens* the opportunity to take the first step to becoming *Homo sapiens genomicus*.

Another reason to support this line of thought is that when natural selection was firmly in place it took many generations for permanent changes to occur. For example, if a mutation occurs in a gene three things can take place; an unfavorable change can occur, a favorable change can occur, or nothing will occur (Grandy 2006a). If a favorable change occurs and the organism acquires a new trait that provides it with a survival advantage, then that organism has a better opportunity to reproduce. Of the offspring, some will inherit the new gene and some will not. Among the offspring that inherit the new gene, some may express it and some may not. Therefore, even though an organism acquires a new gene, by a mutation that is advantageous, there is still a chance that the gene may be passed on but to only a few offspring, if at all. If those offspring do survive and pass on that gene, it will go through the same process. Given this situation, it can be conceptualized that a genetic improvement in a species can take a very long time through natural selection. SGD is an obvious remedy to this. No waiting, no gradualism, and nothing left to chance. A genetic destination can be selected and pursued!

7.2 At the Dawn of Space Travel: Genetically Engineered Astronauts

As humankind looks toward the stars and other planets for potential sources of external materials and habitation, the topic of *space medicine* has been discussed (Grandy 2009b). When humankind travels deeper into space for prolonged periods of time several physiological issues will need to be addressed that may be remedied by genetic engineering and SGD:

1. There is the potential to encounter foreign microorganisms that could exist on other planets or in space. When humankind delves deeper into space our immune systems may not be able to fight off infections caused by space microbes or microorganisms that may be encountered on other planets. Genes or vaccines could be genetically engineered to remedy this in the future.
2. The need for humans to be placed in extended hibernation for long periods of time may also be necessary. During that time travelers would need to maintain physiologic homeostasis and muscle strength in zero gravity. Space medicine, utilizing SGD, would need to provide physiological ways to prevent the loss of strength during prolonged hibernation or perhaps to eliminate the need for prolonged hibernation all together. Hibernation technology will most likely address this issue, but SGD may increase an astronaut's chances of tolerating the hibernation process or decreasing the chances of developing adverse effects.
3. New genes may need to be developed and placed into the genome to allow humans to survive in other environments outside of Earth. Obviously technological space suits

would be needed to shield humans for the harmful effects of space and the environments of other planets. However, the development of new genes or the cloning of other genes found in space and other planets may be necessary[9]. Again this would give rise to new subspecies and/or species, *Homo sapiens extraterrestralis*, which would be derived from *Homo sapiens genomicus*.

4. It is a reasonable possibility that mutations may occur to humans as result of space travel or from visiting other planets because our genes interact with the environment epigenetically. SGD and gene therapy may be of pivotal importance in space medicine to correct these genetic mutations. Therefore, passive human enhancements in space medicine may be extremely valuable in the future.

Therefore, deep space travel and the ability to survive on other planets may require humans to be more than humans. Otherwise this type of potential progress may be limited by an ineffectual genome. It is more likely than not that the ability to travel into deep space and to survive on other planets will require the transformation into *Homo sapiens genomicus*, in addition to advancements in technology. More importantly, for all of these reasons this SGD technology will obviously be needed in the future, but its development needs to start before that i.e. now!

7.3 The Evolution of DNA Consciousness

I proposed in my article *DNA Consciousness* (Grandy 2010b) that the DNA molecule underlies and gives rise to neurological consciousness, in particular the *Hox* and *Pax* genes are responsible for this. With the advent of SGD there would be the possibility of making aggressive human enhancements that would evolve our degree(s) of neurological consciousness. Some examples would be to engineer genes that would allow improvements in memory, the ability to perceive more regions of the electromagnetic spectrum, increase neuron density, increase neuron interconnections, and enhance neuroplasticity (the brain's ability to change). Any or all of these enhancements would give rise to a newer form of neurological consciousness and possibly beyond.

As I have already mentioned, there is a will and form of consciousness in the DNA molecule. This will and form of consciousness has driven evolution for billions of years. It eventually gave rise to a species that would develop the technology to discover the essence of it's self. The DNA molecule is the first molecule to discover it's self, which was accomplished through *Homo sapiens sapiens*! With or without humankind, this will, this DNA consciousness will move forward.

7.4 Do *Homo sapiens sapiens* Need Competition?

I would like to propose one more final reason to support SGD. Based on the evidence that there has been a failure to improve the species through natural selection, perhaps *Homo sapiens genomicus* is needed to provide competition to *Homo sapiens sapiens*. As I mentioned earlier, *Homo sapiens sapiens* has very few predators and as a result this species has grossly overpopulated the planet with a gene pool that now has the potential to become torpid and

[9] This would be assuming that nucleotide life forms are encountered on other planets.

stagnant. With nothing to challenge humankind perhaps *Homo sapiens sapiens* needs some competition.

Obviously many people would have objections to producing superior versions of ourselves. Other people can not conceive the notion of simply being replaced by a new subspecies. However, we must be reminded that nature is not fair. Was it fair when *Homo sapiens sapiens* caused the extinction of the Neanderthals and Cro-Magnons? Is it fair that thousands of other species on this planet have become extinct because of *Homo sapiens sapiens* overpopulation of the planet and voracious appetite to consume nature's resources? Why should *Homo sapiens sapiens* not be held to the same rules? These questions lead into my final section and conclusion; what about the fates of *Homo sapiens sapiens*?

In Conclusion: What about the Fate of *Homo sapiens sapiens*?

As the utilization of SGD comes closer to becoming a reality, perhaps only decades from now, and the appearance of *Homo sapiens genomicus* seems inevitable, the question will arise: What will happen to us, what will happen to *Homo sapiens sapiens*?

Firstly, better adapted species out compete weaker species and extinctions take place in nature all the time. This is a fact and it has happened throughout the history of our planet. It is more likely than not that *Homo sapiens sapiens* will be out competed by the genetically superior *Homo sapiens genomicus*, and *Homo sapiens genomicus* may be out competed down the road by the other subspecies or species that he may give rise to. What is wrong with this? Nothing is certainly unnatural about this progression. In fact, *Homo sapiens sapiens* could become extinct from something other than *Homo sapiens genomicus* e.g. over population, an epidemic disease, the destruction of planet Earth by a comet or meteor, or by war.

It has been well established that extinction is the rule and survival is the exception i.e. *Homo sapiens sapiens* are lucky to be here in the first place. As I asked previously, was it fair that the Neanderthals or Cro-Magnons were outcompeted and driven into extinction? What about the extinctions of *Homo habalis* and *Homo erectus*? Why should *Homo sapiens sapiens* be any different? Of course the argument that SGD did not exist when these other extinctions took place and that those extinctions were all a process of natural selection can be made. As I have pointed out earlier, modern *Homo sapiens sapiens* is no longer as strongly affected by the laws of natural selection and there has been a failure to improve the species. Therefore, it will be unlikely that *Homo sapiens sapiens* are replaced by another subspecies or species due to natural selection i.e. something new and terrifying must take place.

Secondly, evolution and extinction could take place at the same time. This means that as modern humans utilize SGD they would evolve into a new subspecies *Homo sapiens genomicus*. Therefore, modern humans would have evolved and became extinct at the same time. Essentially, *Homo sapiens sapiens* does not have to become extinct in the sense of permanence, but rather extinct in the sense of evolution.

Thirdly, perhaps *Homo sapiens sapiens* is not a special creation with a special place in the universe. Suppose that we are a part of nature just as the Neanderthals and Cro-Magnons were. Of course this does touch on some religious issues e.g. creationism. I will stick to the science and maintain that *Homo sapiens sapiens* are within the confines of nature just as any organism is and there is an overwhelming amount of scientific evidence to support this. However, there is no physical evidence to prove that we are a special creation with a special place in the universe. In fact this mentality that *Homo sapiens sapiens* is a special creation with a special place outside of nature has given rise to a very self-centered and self-destructive species; a species that has grossly overpopulated the planet, a species that intentionally pollutes the planet (or just ignores the consequences), a species that has defiled the laws of natural selection, and a species that kills other members of his species over subjective ideas. Therefore, I think enough evidence is present to justify the genetic engineering of a better species (or subspecies); perhaps one with more planet consciousness, a species with improved laws and morals, a species that is not so motivated by greed, and a species that *earns* a special place in the universe rather than *inheriting* the *belief* that he already holds that special place in the universe. With this in mind perhaps we should change the question from "what is the fate of *Homo sapiens sapiens*" to "what fate does *Homo sapiens sapiens* truly deserve"?

The forth and final statement (and questions) regarding the fate of *Homo sapiens sapiens*; what would be a potential goal of SGD? What if the appearance of *Homo sapiens sapiens* was incidental and only meant to be transient? What if there is a bigger picture? I have briefly mentioned DNA consciousness in this paper. In this theory I have propose that quantum consciousness gave rise to DNA consciousness, and that DNA consciousness has given rise to other forms of consciousness; cellular consciousness, animal consciousness, plant consciousness, and neurological consciousness (Grandy 2010b). I also proposed that DNA consciousness underlies neurological consciousness and provides a continuum, i.e. that DNA consciousness is the driving force behind neurological consciousness and natural selection for that matter. Perhaps the DNA molecule has a will of its own perhaps the molecule wants to grow and to continue to evolve into the twilight of the future! It is possible that during this growth spurt *Homo sapiens sapiens* incidentally came into existence for the mere purpose of discovering the DNA molecule and to unlock its secrets. Is that what we are here for? That is to say that the will of the DNA molecule fueled the drive of natural selection to evolve a species with the capacity to develop the necessary technology to discover the DNA molecule. Again, DNA is the first molecule to discover itself! However, it needed to develop neurological consciousness to achieve this. As neurological consciousness evolved and human consciousness emerged this became possible. Now that same DNA consciousness is pursuing SGD!

Now that this has all been achieved and the potential to have SGD is an awakening reality, perhaps there is no need for *Homo sapiens sapiens* anymore; especially taking into consideration that the DNA molecule is currently limited in its use of natural selection as a driving force in *Homo sapiens sapiens* because there is a failure to improve through natural selection. This is where the rise of *Homo sapiens genomicus* comes into place. Through *Homo sapiens genomicus* the will of the DNA molecule, the DNA consciousness, can now have infinite potential and the ability to evolve higher levels of consciousness. This is no longer science fiction! The secrets to nature, life, and potentially to the universe have been unveiled and thus far none of the potentialities has collapsed.

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