Application of Incremental Technologies in Considerations of Transhumanist Aesthetics – Project "Who nose"

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ABSTRACT

Transhumanist speculations have been present in intellectual circles since the 1960s. The term "transhumanism" was coined in 1957 by biologist Julian Huxley, who defined it as "man remaining man, but transcending himself by realizing new possibilities of and for his human nature". Will the boundaries of aesthetics remain untouched in face of new achievements, both in medicine and those coming from the need to explore space?

In 2017, NASA published the results of the Human Research Program. The aim was to find out more about the impact of long stays in space on the human body, like manned trips to Mars. The human body will have to face new physical conditions on the Red Planet, such as lower temperatures, a less dense atmosphere, significantly higher radiation and many more. The impact of such conditions is visible and highly variable also in other organisms, including mammals that have the best sense of smell.

3D printing technology is developing continuously and already today we are able to print an ear that can be used for transplants. If this is the case, does it have to look the same? Based on the research regarding the impact of climatic conditions on the shape of noses as well as state of the art regarding such areas as mountaineering, biomimetics, plastic surgery and taking into account mental factors, the article presents original nose designs, aesthetic speculations and interpreting the above visual and formal data.

KEYWORDS

Speculative design; 3D printing; Additive Technology; Transhuman; Design; Experiment; Plastic Surgery; Mars; Biomimetics; Cosmonautics.

ARTICLE INFO

Received: 21 November 2018
Accepted: 30 November 2018
Published: 18 December 2018

https://dx.doi.org/10.7559/citarj.v10i3.568

1 | INTRODUCTION

The future starts today and is also affected by past events. One of the key tools in this scope consists of foresight studies and specifically technological foresight. This is a set of tools and research methods that combines current activity (e.g. regarding science, business, society) with an uncertain but usually desired future (Voros, 2003). There is no single ending. There are many probable and possible scenarios. This is how speculative design, that is becoming a tool in strategies of forecasting macro trends, works.

Visualising the future may affect the development of science and business, and concept cars are an example of such solutions. One of the latest popular examples also in the area of transhumanism is a project called *Meet Graham* that was developed upon the request of the Australian Transport Accident Commission. The project involved the cooperation of an artist, Patricia Piccinini with Christian Kenfield, a trauma surgeon from the Royal

Melbourne Hospital, and Doctor David Logan, an expert on accident research from Monash University. Together they created a human model that would be able to survive a car accident. Applying a reverse approach, where you adjust the human body to modern cars, carried a more meaningful message than "be careful, buckle up". The Australian project, besides the public service campaign message, shows a completely different side of science.

My project is based on research conducted by the University of Pennsylvania concerning the change of the shape of nose depending on the conditions in which our ancestors lived, which I have combined with the state of the art. I present NASA research, information regarding programmes on inhabiting Mars as well as technological and surgery possibilities and the progress of 3D print, and on this basis, I propose a futuristic vision of how our noses could look if we lived on Mars (Figure 1).

Both in literature and in pop culture, the image of extra-terrestrial creatures often extended to the point of kitsch. However, in the context of aesthetic considerations it is worth recalling that the creators of fairy-tale creatures and humanoid characters based their creations on assumptions that concerned the environment they existed in. The famous characters from James Cameron's *Avatar*, the diversity of races presented in the cult film *5th Element* by Luc Besson, or even the suggested progenitors of people from the movie *Prometheus* by Ridley Scott. In the history of art, we are able to notice such explorations in depictions of the un-known and the inexplicable. I was investigating this topic while working with one of my degree candidates, whose task was to create a monster based on modern pop culture aesthetics and the historical contexts of architectural details – gargoyles and sparrow hawks. As an educated art historian, Ms. Iwona Haurash paid attention to how we people deal with our lack of knowledge in situations when the unnamed and unknown can only be imagined.

In medieval times, after the western world abandoned ancient traditions and an empirical approach to reasoning and perceiving the surrounding world began to disappear, the place of logical cognition was replaced to a great extent by the imagination. Where there was no empirical data to build a clear representation of nature and the laws of physics, untamed human fantasy came into action, inventing dark, non-existent creatures that sometimes consisted of compilations of existing animal species. A universe built in such a way was an attempt to explain the incomprehensible and mysterious, and creatures that were the instruments for that comprised the collection of medieval bestiaries.

As an artistic expression of human cognitive aspirations, they focused mainly on the sacred sphere as elements of architectural decorations or rested on the margins of manuscripts. They combined not only a decorative or – in case of gargoyles – utilitarian function, but also an apotropaic one. Utilising in this case ugliness and the macabre as magical means of defense against evil, and de-estheticizing public space at the same time.

In modern times, along with the development of scientific methodology, demystification of the laws of nature and an increased interest in them, people began to accommodate to the so-called "bestiary". Fear and horror subside to curiosity. As a result of growing interest in teratology in the context of science, "mysterious creatures" no longer scare us and have moved into the world of fantasy, fairy-tales and stories. They have become mere inspiration and entertainment. In her work, Haurash points out that nature was documented and described, and less and less unexplored parts of the world remained where unicorns, wyverns or basilisks could live (Kitzinger, 1977). J.E. Harrison, a British researcher, wrote that art came from "unfulfilled desires, those human perceptions and emotions that couldn't be vented through practical activity". It also explains our fondness for ugliness and drastic, emotional scenes. "To understand why seeing un-pleasant performances in art can be pleasant, …it is important that not only pleasure and delight, but also pain and suffering can intensify and enrich our perception, our taste of life" (Dziemidok, 1988).

Figure 1 | Visualisation of speculative idea.

References to teratology are not accidental, on the contrary, they are indispensable from an aesthetic point of view; transhumanist speculations are also the awareness and context of ugliness. In my project, I focused on noses as a soft tissue that can be made with incremental technologies, but also due to the fact that rhinoplasty is one of the most popular surgeries in aesthetic medicine (Nahai, 2015).

The nose is mainly composed of soft tissue that may be subject to changes, as indicated by numerous surgeries conducted on this body part almost all over the world. Such surgeries are often per-formed not due to health reasons but primarily for the purposes of aesthetic medicine. (Gracindo & Moreno, 2018) There are also situations where one is related to the other and then we have an example of an unnatural creation being better than the genetically determined "original". Is that a good thing?

Plastic surgery also brings up the problem of ugliness, or in more general terms, speculations over attractiveness. The presented nose designs were consulted with a plastic surgeon, however due to a very sensitive group of clients, the doctor wanted to remain anonymous. His opinion, respecting the will of its author, will be included further in this publication, concerning the aspects related to a change in appearance.

2 | TRANSHUMANISM AND BIOMIMICRY

The story of Oscar Pistorius is an interesting case, worth mentioning at this point.

Pistorius participated in the Paralympics. He wanted to take part in the regular Olympics and he succeeded in 2012. However, there were some controversies and it was said that his prosthetic legs may have given him an advantage over people without disabilities. The decision divided the world of sports. One of the counterarguments regarding this decision that was also shared by a Polish long jumper, Maciej Lepiato, states that prosthetic legs constitute a technical performance enhancement because they give the athlete an advantage. This case provokes a question regarding the bio-ethical aspect in relation to the limits of interfering with the human body. Nevertheless, it cannot be denied that prosthetic legs increased the human performance at that particular instance. Since noses are already a part of the body that is subject to modification, it is worth thinking about their form. If technically and technologically we are able to print the human ear from a material that can be used for implementation, does it have to look exactly like the "original" ear?

Nature displays a huge variety of noses. Let us focus on mammals because they have a highly-developed sense of smell. Examples of extreme forms of noses are presented by snub-nose monkeys, whitemargin unicornfish (which is actually a fish) as well as by the sword-nosed bat.

Nature has developed noses throughout evolution, adjusting them to climate and conditions. In my designs, I treat them as useful guidelines for new solutions for human noses, using biological inspirations, or biomimicry, as is commonly known in

engineering. One of the most notable examples of a mechanism of nature used by humans is the hook-and-loop fastener. It was transferred from the world of plants into a solution used by people. Thanks to its use by NASA in astronaut suits, it was popularised and became widely used.

2.1 SELECT PHYSICAL AND FUNCTIONAL ASPECTS OF THE NOSE

> *"-The structure of the nose enables to warm up or cool down air adjusting it to the body temperature before it reaches the lungs*
>
> *- The nose also acts as a filter so that it catches small particles preventing them from reaching the lungs*
>
> *- The nose moisturises air adding humidity to pre-vent the respiratory tract from drying*
>
> *- It strengthens and impacts one's voice*
>
> *- It supports the sense of smell*
>
> *- It can attract and impact the biology of attraction"* (Little et al., 2011)

Changes of living conditions or atavistic needs relating to the sense of security, choosing stronger and more attractive units for extending the kind are key. Hence, the discussion regarding the change of the appearance and the model of attractiveness seems justified.

Our noses perform many more significant functions. They warm and moisturize the inhaled air, which helps to prevent illnesses and injuries to our airways and lungs. Scientists have long suspected that the shape of the nose had evolved in response to changing climate conditions in a dry and cool climate natural selection favoured noses which are better suited for warming and moisturizing the air.

3 | NOSE DESIGNS

I have prepared three nose designs and I focus on different functions in each case. I visualise the possible scenarios of the future in the form of unique nose designs by means of the technological foresight method.

3.1 NOSE DESIGNS - FORESIGHT DATABASE

3.1.1 RESEARCH FROM THE UNIVERSITY OF PENNSYLVANIA

Research conducted in 2017 by the University of Pennsylvania indicates that the human body has been evolving over millennia in order to genetically adapt to existing climatic conditions. The record of this process can be physically observed based on the example of our noses. 3D face imaging was used in the research. 476 volunteers from West Africa, South Asia, East Asia and North Europe were measured. It has been ascertained that the width of our nostrils correlates with the temperatures and humidity of the local climate in which the ancestors of the volunteers lived. People whose parents and grandparents came from areas with a warm and humid climate had wide nostrils. People originating in cold and dry regions had narrower ones. The strongest correlation between the width of the nostrils and the climate can be observed in North Europe. This means that a cold and dry cli-mate is particularly favourable for people with narrow noses (Zaidi et al., 2017).

Scientists have also discovered that the shape of the nose is hereditary. They have found a correlation between genes and a general similarity of noses in large groups of unrelated people. This means that the shape of your nose is to large extent genetically conditioned.

3.1.2 ADDITIVE TECHNOLOGY (3D PRINTING)

The possibilities of 3D printing keep developing. The race is in progress and it does not only relate to technology but also, or primarily, to materials. The spectrum is so large that during a London-based conference regarding 3D print in 2018, the speakers talked about subjects regarding implants, aviation and jewellery within one discussion panel. The technology is not really that new because it was already known in the 1970s. The official date considered as the year 3D print was created is 1984 but conceptual work on the technology started in the 1970s. In 1971, Pierre A. L. Ciraud described a method of manufacturing items with any geometry by adding powdered material, using a source of heat for this purpose. This was published on 5 July 1973 and created a starting point for the technology known today as Selective Laser Sintering (SLS) (Reichental, 2018). In any event, from that point on, the technology was underway, both in terms of

scientific experiments as well as hacker spaces supporting DIY movements. What is more, the technology has become popular and a race is in progress regarding the variety of materials, improved prints and more precise parameters of print. One may also list materials and industries where we do not consider print as a prototype or a method of obtaining a quick prototype but rather as a final product. For example: a bridge in the Netherlands entirely printed by a 3D printer at the University of Technology in Eindhoven, Chinese buildings printed in 3D, as well as items printed in 3D used in space. Entries on printed habitats and also printed tools were a subject of a competition announced by NASA, entitled the “3D Printed Habitat Challenge”. In bio-medical engineering, work is taking place on the bio-printing of support structures that would later become the base for growing cells. One such company that is transferring those achievements to the stage of clinical tests is the Wake Forest Institute for Regenerative Medicine (WFIRM), which proved that it is possible to print tissue structures in order to replace damaged or diseased tissue in patients. Scientists from WFIRM have successfully printed ears, bones and muscles (Kang et al., 2017).

3.1.3 CONDITIONS ON MARS

Mars is the planet closest to Earth. Mars is not a hospitable planet, however compared to our neighbouring Venus, we may talk about harsh conditions that may become difficult but not insurmountable challenges for scientists, engineers and other representatives of science. Because of these conditions, the people of Earth chose Mars instead of Venus (Birch, 1992). Let's have a closer look on the physical conditions on the red planet.

Mars is a lot cooler than Earth, with an average temperature of -63°C, which may drop to as low as -140°C. The lowest temperature on Earth was -89.2°C, recorded in Antarctica.

Since Mars is further from the Sun, the amount of solar energy entering its upper atmosphere (the solar constant) is half of that entering Earth's upper atmosphere. Since the sunlight is not reflected into the atmosphere, the surface of Mars gets a similar amount of energy as the surface of the Earth. However, the lack of atmosphere has other consequences. One of it could be that Mars's orbit is more elliptical than that of Earth, which increases the amplitude of temperature fluctuation and the solar constant. Currently, the atmosphere on Mars is very thin (approx. 0.7% of the atmosphere of Earth), which gives little protection against sunlight and solar wind. It is too thin for people to survive without pressure suits. We need to be aware that the atmosphere on Mars consists predominantly of carbon dioxide. Therefore, even with a pressure correction atmosphere, the local pressure of CO2 on the surface is 52 times higher than on Earth, which makes it possible for plants to grow on Mars. The circumstances that we need to consider when we are thinking of visiting the Red Planet is that Mars has a weak magnetosphere, so the protection from solar wind is low. The radius of Mars is half of the radius of Earth, and its mass is 1/10 of the mass of Earth. This means that Mars has lower density than the Earth.

This is just the tip of the iceberg of problems that we will have to deal with if we want to create a habitat on Mars and realistically think about its colonization or a regular life there. How could this affect our bodies? Not in the perspective of the next few years, but in a more distant and long-term one (McKay & Davis, 1991)?

3.1.4 PREPARATIONS FOR LIVING IN SPACE AND MARS

In March 2015 Scott Kelly went to the International Space Station, where he spent 342 days. During that time his twin brother stayed on Earth and both of them took part in numerous studies. The aim was to assess how a very long space travel, similar to that required for humans to get to Mars, would affect the human body, on the basis of comparison between two most possibly similar organisms. Another program with a similar scope is Mars 500, a Russian experiment which commenced in March 2009 and was supposed to prepare people for a flight to Mars. It consisted in keeping 6 volunteers closed for 500 days, in order to examine their psyche. The project was carried out in the Moscow biological-medical institute (Schwirtz, 2009). A similar space camp was prepared for a trial start of extra-terrestrial technologies and research strategies on Devon Island. The island serves as a "home away from home" to the members of the Haughton-Mars Project run by NASA. The EXO 17 Mission is a Polish contribution to the research concerning the subject in question. The surface of Mars was imitated by the Mars Desert Research Station in

Utah, and it comprises tests of an air filtering system and methods of stress management.

The examples of how humans are getting ready for a Mars expedition and thus to conquer the space, and the recent attempt of the Falcon Heavy developed by SpaceX, shows that this moment is right around the corner (Vance, 2017). These events encourage us to view ourselves from a different perspective.

The human body will have to change if we are to adapt to new physical conditions. Are these the new challenges for medicine or a direction of evolution? Undoubtedly, environmental conditions affect the body and in the course of time, in line with the law of evolution, adapting to changes is inevitable.

3.1.5 CONSULTATIONS WITH AN ANALOGUE ASTRONAUT

Analogue astronauts are specifically trained space-suit testers. After an extensive selection process, they go through a several months long basic training. Analog astronauts are used for technical tests and Mars simulations.

OeWF [1] analogue astronauts are specifically trained for the OeWF Mars spacesuit simulator "Aouda" and are assigned "in analogy to" future human (Mars) expeditions for preparatory research and development projects.

> *"In the case of the helmet, that's definitely something unique. The flow of air in the Aouda spacesuit simulators developed at the Austrian Space Forum is maintained by a ventilation system that circulates air. So it's not a closed system, instead fresh air is circulated into the helmet. From my last mission in the Dhofar desert in Oman in February, there were a few observations:*
>
> *- Because access to fresh air is restricted, when you exert yourself, there is a strong build-up of CO2 in the helmet. The fans are used to circulate the CO2 out, but you have to be careful, because the CO2 levels can become critical for breathing. For this reason, we have CO2 and O2 sensors in the helmet that relay data to the operations base in the habitat, where the levels are being constantly monitored. So, in other words, when you're doing any heavy lifting, you're much more conscious of your breathing in the helmet, and you try to pay attention to the CO2 levels.*
>
> *- Because the air you breathe out contains moisture, sometimes the ventilation system isn't able to circulate in fresh air fast enough, and you end up with condensation inside the helmet visor that restricts your vision. So, when you're breathing, you're also actively trying to control output, to ensure that you don't fog up the visor.*
>
> *- In the Dhofar desert, there was a lot of fine dust that made it past the filters in the ventilation system. This meant that at times the fresh air came in with dirt, so when you were breathing, you suddenly had dirt in your mouth. I was typically breathing a lot through my mouth and was conscious to reduce that when I could feel that there was fine dust being circulated by the ventilation system. The most surprising thing about the analog mission was just how easy it is for you to "escape reality". The environment really helped in creating the feeling that we were really on Mars, which increased the fidelity of the simulation experience."* (Kartik Kumar, personal communication, 2018).

This unique and dedicated statement by an analogue astronaut and engineer contains very interesting remarks that should be taken into consideration while developing the project. Kartik Kummar's opinion was issued after the noses had been designed. In speculative design, it is vital to be able to identify information that is crucial for development instead of information that only reflects the existing world Kummar indicated that there was indeed a problem with spending a long time with the helmet on, which affects human behaviour. Among such indications, this one encourages further considerations.

3.2 NOSE DESIGNS - CONTEXT

The project is of a speculative nature; it is also worth noting its transhumanistic character. Implants, foreign bodies implanted in the body in order to recreate natural function or aesthetics of a damaged organ, are a reality. Plastic surgery of the nose, rhinoplasty, is one of the most common and yet one of most complicated plastic surgery

procedures (Rettinger, 2007). Surgery may correct the shape of the nose by reducing or increasing its size, modelling the septum and the tip of the nose, or regulate the distance between nasal holes. Plastic surgeons may lengthen or shorten the nose, however in most cases we are dealing with a complex surgery regulating nasal asymmetries. Changing the shape of the nose could also affect protection against frostbite or susceptibility to sunlight. There are a number of statistics concerning frost-bite in the world medical literature. Studies conducted by Finnish doctors from the Health Institute in Oulu show that the body parts most susceptible to frostbite are the nose, ears, cheeks and chin as well as the fingers and toes. Frostbites cause the shrinking of blood vessels; strong narrowing of skin vessels may lead to skin ischemia and tissue necrosis. In many animals living in a cool climate the nose is covered with more rigid skin and is built in a different way, which makes it less prone to frostbites and sunburns. Aesthetic medicine is often associated with a whim of the wealthy who seek to change their image not for health reasons, but merely to satisfy their vanity. However, aesthetic medicine stems from obviously more significant situations, associated with reconstructing faces after accidents, burns or other, for instance, genetic defects directly affecting a patient's health. The significance of the nose outside the medical context is proven by the aforementioned studies of the scientists from Pennsylvania, which show that nose also has a complex evolutionary history, and the researchers suspect that additional factors, such as cultural preferences during mating, also played an important role in the formation of this organ. Research on the evolution of the shape of the nose and climate adaptation might have not only medical but also anthropological consequences (see Figure 2).

3.3 PSYCHOLOGICAL AND CULTURAL ASPECTS IN THE CONTEXT OF AESTHETICS

Below, I include an anonymous opinion of a plastic surgeon concerning the project of speculative noses. I was told people aren't ready for such modifications due to their own human psyche. For a typical person, everything that diverges from the classic model of beauty is a big problem.

> *"Some noses look like the problems that people turn to surgeons with in order to fix them. Regardless of how such modified noses would make life easier, everything is broken by human self-acceptance. People*

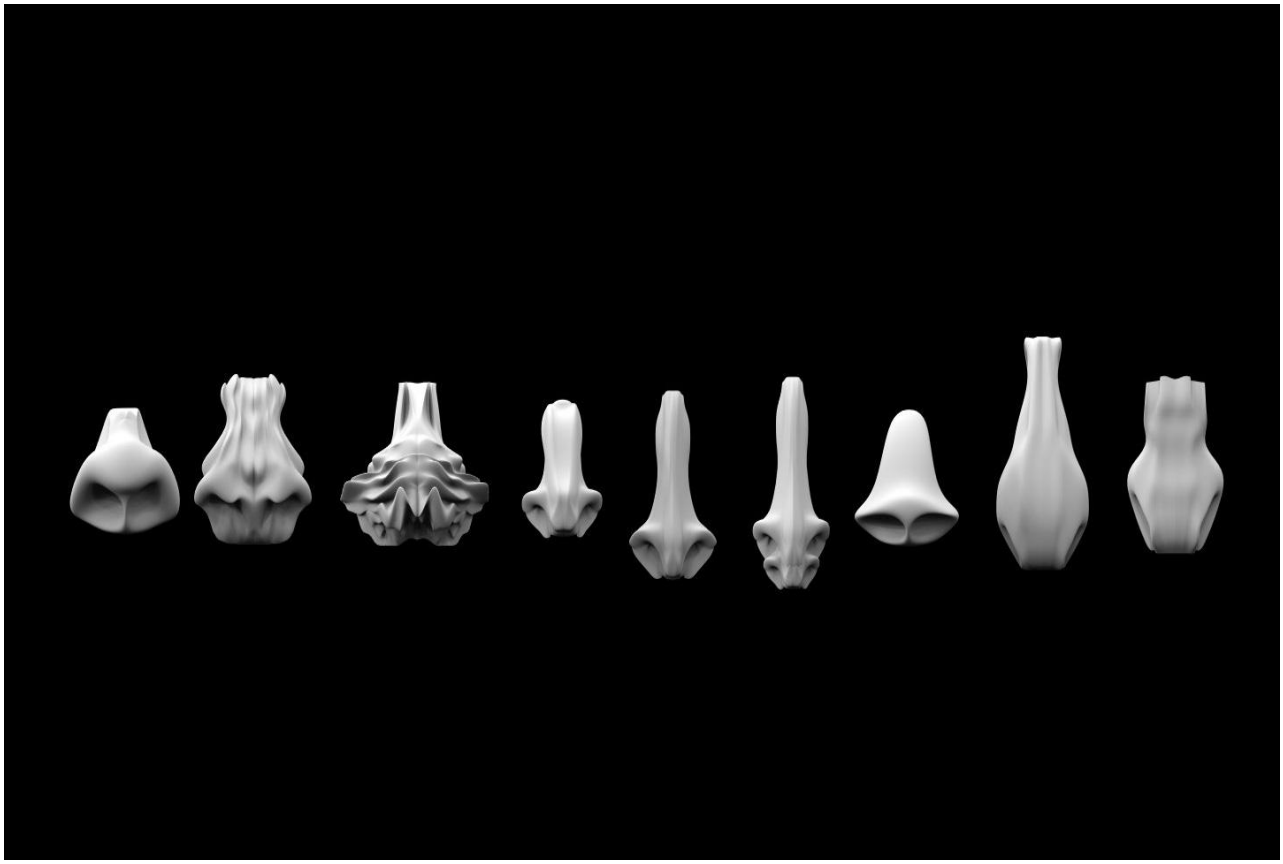

Figure 2 | Noses - different versions taken into account.

will start committing suicides, being unable to stand themselves.

Statistics collected at various plastic surgery conferences show that given the choice whether nose correction should alter their appearance, breathing comfort or smell improvement, people choose appearance. In the opinion of the surgeon this means that the biological function of the nose and increased comfort of life are in second place behind looks."

That is very interesting, as it could be assumed that along with altering culture, the requirements of our attractiveness could change as well. Naturally, the designs of the noses presented below are strongly exaggerated on purpose, in order to present key assumptions. In the project, it was important to clearly show how I interpret environmental and psychological aspects in the context of aesthetics, for the purposes of discussion (that is what those aesthetic transhumanist speculations consist of).

In the context of existing tribal cultures, such as the Apatani people inhabiting the mountainous areas of the Indian state of Arunachal Pradesh, or even the "perfect angle" of the female nose recently promoted in social media (106 degrees), we can say that both our environment and our culture affect the changes we expect with regard to attractiveness. The fact that we are more willing to bear, for instance, dyspnoea instead of unacceptable looks, provokes reflections all the more."

3.4 DESIGNS/SCENARIOS

3.4.1 DOUBLE NOSTRILS

a) Long narrow noses are genetically associated with Nordic facial features (Zaidi, 2017). This is associated with the fact that with a narrower nose, it is easier to warm up air, as compared to wide nostrils, due to low temperatures, both during travel and after landing (see Figures 3 and 4).

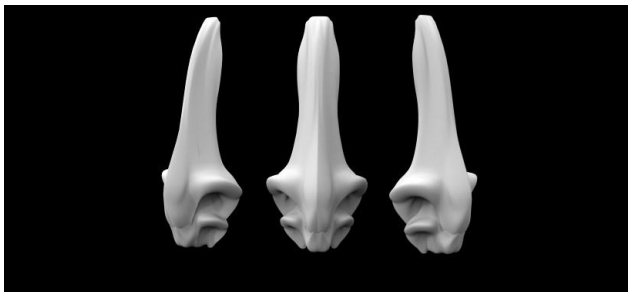

Figure 3 **|** Nose project Double nostrils – rendered nose in different views.

b) On Mars, people will live in habitats. They will wear space suits and helmets while walking on Mars' surface and they will be forced to live in air-conditioned spaces. Also, the trip there will involve staying in air-conditioned rooms. Already today, we spend plenty of time in air-conditioned rooms and this has its consequences (allergies, colds, dryness). Analogue astronauts practice such a preparation on Earth.

c) We cannot forget about mental factors. Long travel and time spent in closed space may impact anxiety or less severe symptoms such as discomfort. Relaxation techniques inspired by Pranayama breathing exercises show a huge impact of breathing through the nose on staying calm and providing oxygen to the brain. Double nostrils make it possible to strengthen the sense of a deeper breath.

3.4.2 BOXER

a) Utilising the experience of mountaineers, we know that the nose being a protuberant part of the body, is the most prone to frostbite. Additionally, it is also subject to sunburn due to sun rays being reflected from snow. Burns also occur at the bottom of the chin or neck, according to Adam Bielecki, a Polish mountaineer. Mountaineers use special bands and tapes for covering noses and cheeks that protect against the temperature and sun. For this purpose, the model of this nose is flatter and it sticks out less (see Figures 5 and 6).

b) The width and size of the nostrils in this case is also related to the sense of better ventilation and deeper breath. In the animal world this can be

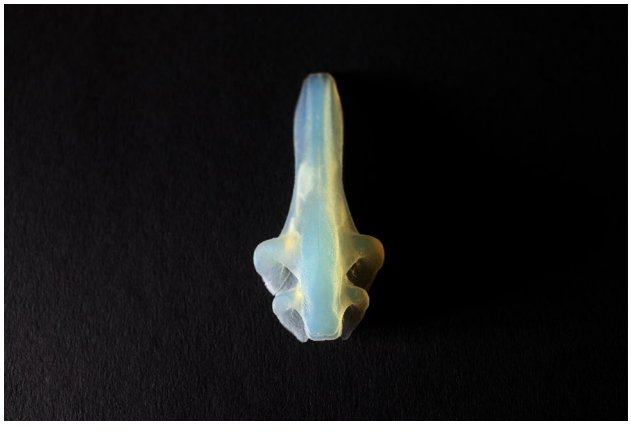

Figure 4 | Nose project Double nostrils – photo of 3d printed object in Flexible material Tango Plus 9740 . Technology polyjet solidified liquid photopolymer by using UV light.

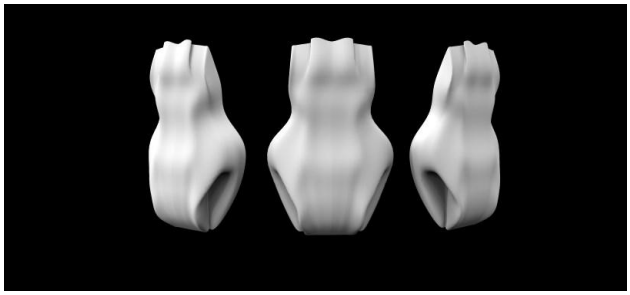

Figure 5 | Nose project *Boxer* – rendered nose in different views a) similarly to the design of radiators, the wavy surface of the nose may impact heat transfer.

observed in the African Buffalo.

c) Wide biomimical nostrils and a flattened nose may also affect one's self-confidence. The abovementioned African Buffalo is one of the most dangerous animals in the world, which is enhanced by its specific nose appearance. An additional stylistic reference regarding a flat nose and wide nostrils is the structure of boxers' noses, which due to numerous injuries resulting from fights, modify their noses' appearance. In the context of new attractive-ness, it could create another subject of discussions.

d) From the point of view of functionality, such a nose would also be less prone to injuries relating to the long use of helmets, that would break the nose in the case of a fall or trip, without securing it.

3.4.3 RADIATOR/RESONATOR

a) The wavy surface reaching deeper may also have a clear impact on one's voice. The nose is a resonator and has an influence on acoustic effects. Since communication is mainly conducted with the use of microphones, its effect will be the same as in an aircraft cockpit, which means that some frequencies will be interrupted by noises, and this

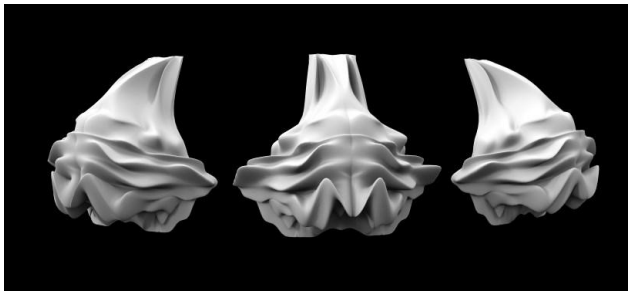

Figure 7 | Nose project *Radiator / Resonator* – rendered nose in different views.

would make communication more difficult. Similarly, basstraps, the wavy structures you may have noticed used in recording studios, contribute to changing the acoustic effect (see Figures 7, 8, and 9).

b) Additionally, the example of the nose structure of the sword-nosed bat also shows a nose that is very fleshy. Scientists are of the opinion that this may be associated with echolocation. Due to the disrupted day (Earth) rhythm and the sense of day and night caused by artificial lighting, the direction in re-search regarding the transfer of waves and vibrations with reference to echolocation, also seems interesting.

4 | CONCLUSIONS

The "Who nose" project (see Figures 10 and 11) refers to the possibilities of 3D printing and plastic surgery in the context of challenges that we will all face. It has a speculative character. It does not mean that people will grow such noses in an evolutionary way on Mars. Already at this stage of medical development, we introduce many changes into our body: artificial eyes, mechanical prostheses, bypasses etc. Perhaps this apparently stylistic or aesthetic change could have a bigger impact on the

Figure 6 | Nose project *Boxer* – photo of 3d printed object in flexible material tango plus 9740. Technology polyjet, solidified liquid photopolymer by using UV light.

Figure 8 | Nose project *Radiator / resonator* – photo of 3D printed object in Flexible material Tango Plus 9740. Technology polyjet, solidified liquid photopolymer by using UV light (front view).

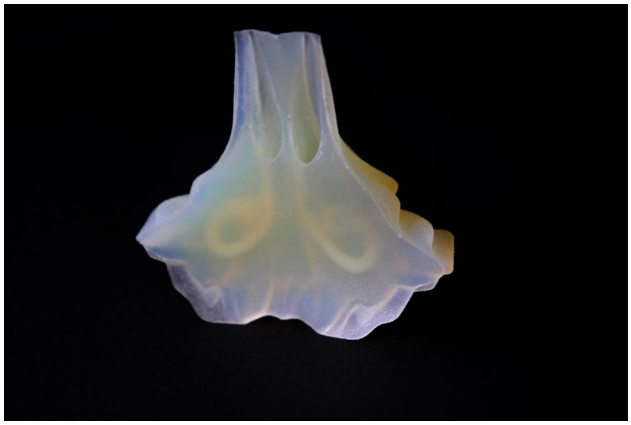

Figure 9 | Nose project *Radiator / Resonator* – photo of 3D printed object in Flexible material Tango Plus 9740. Technology polyjet, solidified liquid photopolymer by using UV light (back view).

comfort of our lives on Earth.

I have considered different stylistic options based on the above assumptions and decided to present three options that in my opinion will be a best representation of the issues and their options discussed herein. Since this is a speculative project, the answers will not be definite, and they may be a proposal of interpretation.

As a summary of my own conclusions, I also present part of an opinion about the project by Prof. Andrzej Borman, PhD, from the Department of Animal and Human Physiology, Faculty of Biology at the University of Gdańsk:

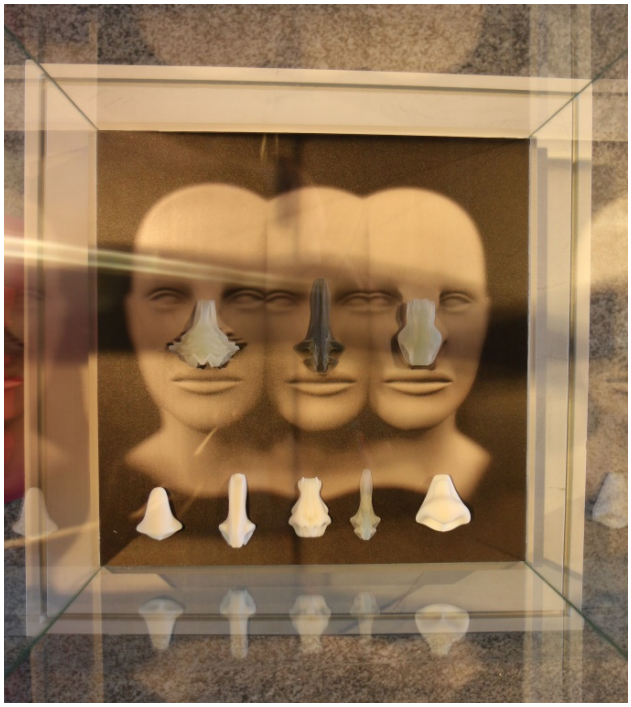

Figure 10 | Marta Flisykowska, Who Nose?, Museo del Traje, Madrid.

"…I believe that in the future, the most likely 'driving force' behind changes similar to those proposed in the project – in the form and shape of body parts, irrespective of their function – will be the aesthetic values that constitute cultural elements. Indeed, the perception of feminine/masculine attractiveness has evolved over time, differently in different cultures, and will doubtlessly continue to change. In the future, in the conditions of dynamic development of science and technology, we will obtain previously unknown abilities to modify our appearance and one can imagine that from superficial adornment we will move on to much more permanent structural modifications of our body in accordance with the current trends and the ideals of beauty applicable at the time.

In my summary, I would like to stress that regard-less of my reservations as a physiologist, ex-pressed above, I believe Dr Marta Flisykowska's project to be tremendously interesting and imaginative. Nobody knows where and how far the trans-formation of humans as a biological species in-spired by the idea of transhumanism will go and how an average/typical human will appear in, say, fifty years. Dr Flisykowska's unique vision, inspired by Earth's nature, presenting different variants of the structure of the nose of future humans, whilst in my opinion not necessarily related to adaptation to living on Mars, appears to be one compelling possibility of our development."

I have asked also bioethicist Jakub Zawiła-

Figure 11 | Marta Flisykowska, *Who Nose?*, Museo del Traje, Madrid.

Niedźwiecki, from Center for Bioethics and Biolaw University of Warsaw, for her opinion. I find it also interesting to present it as a final thought:

> *". . . The history of nose reconstruction dates at least to the middle-ages which shows how important that part of the face was and how grave a mutilation its loss meant. Implanting new artificial noses would carry varied risks and unknown effects for both physiology and especially psychology. Modern controversies regarding face transplants, including worries about one's body image and psychological effects of it could be mentioned here as an analogy.*
>
> *While the project itself does not pose bioethical issues as such – it does not affect actual human beings for now – it might be worth keeping in mind that the future modifications such as those posited in the project would require extensive bioethical and psychosocial investigation… As well as conducting research regarding issues typical for debates of human enhancement such as the limits of acceptability of variability within human society (which it would seem still is a problem for societies even without modifications), relationship between adaptation to physical and social conditions as a factor of human flourishing, and last but not least what are the limits of modification that allow other humans to recognise an entity as human. Indeed when viewed this way, noses could only be a pretext to investigation of what actually are the limits of humanity and our understanding of homo sapiens species… Both opinions can be read at the flisykowska.com site, where I present this project too."*

ENDNOTES

[1] OeWF: Austrian Space Forum is a citizen science organization for space professionals and people with a passion for space in collaboration with both national and international research institutions, industry and politics.

REFERENCES

Birch, P. (1992). Terraforming Mars Quickly. Journal of the British Interplanetary Society, 45, 331-340.

Dziemidok, B. (1988). Controversy About the Aesthetic Nature of Art. British Journal of Aesthetics, 28, 1-17.

Gracindo, G., & Moreno, L. (2018). Medical Ethics Code: an Analysis from Ethical-Disciplinary Cases Against Medical Professionals within the Specialty of Psychiatry. International Archives Of Medicine, 11. doi:10.3823/2552

Kang, H. W., Lee, S. J., Ko, I. K., Kengla, C., Yoo, J., & Atala A. (2016). A 3D bioprinting system to produce human-scale tissue constructs with structural integrity. Nature Biotechnology, 34(3). doi: 10.1038/nbt.3413

Kitzinger, E. (1977). Byzantine Art in the Making: Main Lines of Stylistic Development in Mediterranean Art, 3rd-7th Century. Cambridge: Harvard University Press.

Little, A. C., Jones, B. C., & DeBruine, L. M. (2011). Facial attractiveness: evolutionary based research. Philosophical Transactions of the Royal Society B: Biological Sciences, 366(1571), 1638-59.

McKay, C. P., & Davis, W. L. (1991). Duration of Liquid Water Habitats on Early Mars. Icarus, 90(2), 214-221.

Nahai F. (2015). Aesthetic Surgery Journal ushers in 2015 with all things "new". Aesthetic Surgery Journal, 35(1), 108.

Reichental, A. (2018). The Future Of 3-D Printing. Forbes CommunityVoice, 23 January 2018. www.forbes.com/sites/forbestechcouncil/2018/01/23/the-future-of-3-d-printing/ (last access: November 2018).

Rettinger, G. (2007). Risks and complications in rhinoplasty. GMS Current Topics in Otorhinolaryngology - Head and Neck Surgery, 6, Doc08.

Schwirtz, M. (2009). Staying Put On Earth, Taking a Step to Mars. The New York Times, 30 March 2009. https://www.nytimes.com/2009/03/31/science/space/31mars.html (last access: November 2018).

Vance, A. (2017). Elon Musk: Tesla, SpaceX, and the Quest for a Fantastic Future. New York: Ecco Press.

Vanderbilt, T. (2012). How Biomimicry is Inspiring Human Innovation. Smithsonian Magazine, September 2012. https://www.smithsonianmag.com/science-nature/how-biomimicry-is-inspiring-human-innovation-17924040/ (last access: November 2018).

Voros, J. (2003). A Generic Foresight Process Framework. Foresight, 5(3), 10-21.

Zaidi, A. A., Mattern, B. C., Claes, P., McEcoy, B., Hughes, C., & Shriver, M. D. (2017). Investigating the case of human nose shape and climate adaptation, PLoS Genetics 14(1). https://doi.org/10.1371/journal.pgen.1007207

BIOGRAPHICAL INFORMATION

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