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BIOENGINEERING: HISTORY AND PROSPECTS

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Annotation. The article deals with the general outlook on bioengineering. Slight historical note and the way of the development as well as modern look on bioengineering are given. Some ways and directions of the further development of bioengineering are offered.

Keywords. Bioengineering, biotechnology, science, research, development.

Due to the Tech revolution, such field of knowledge as bioengineering, which even officially didn't exist a century ago, is so widely spread now and has been integrated in various spheres of our modern society.

Even though mostly everyone heard of bioengineering, it will not be superfluous to mention, that nowadays this field is not just a narrow pathway somewhere between science and fiction, as it was at the beginning of its development in 1950s. Here probably we should also mention that before World War II bioengineering was unknown in the way it exists today, but it had already been represented by agricultural and chemical engineering involved in fermentation processes, these branches were part of biotechnology – the ancestor of bioengineering. Due to little communication and interaction existed between the engineers and the life scientists, those representations were considered as bioengineering. This fact was slightly changed in 1950s, when bioengineering meetings were dominated by sessions devoted to medical electronics. Medical instrumentation and medical electronics continued to be major areas of interest for quiet long and still exist as one of the main concerns [1].

Today the field of bioengineering includes seven main branches: medical engineering, agricultural engineering, bionics, biochemical engineering, human-factor engineering, environmental health engineering, and genetic engineering. All of them creates something to improve our everyday life. So, if we look through the achievements of bioengineering field of the last six years, we will easily notice, that all of the researches are truly essential to both scientific world and life of the society in general, starting with the most common, such as selection in agriculture and cattle breeding, and going further and deeper into such field as stem cells growing and creation of artificial limbs.

But if we also take a look at these results and compare them with, for example, all achievements since 1917 (when term “biotechnology” was firstly officially used) till 1998, it will be obviously seen, that the tempo of development has incredibly grown and today the result of six year's work is comparable, if not even bigger, than the eighty year's one in the same field previously [2], [3].

That is impressive, but also brings us to one more question: what will be the consequences of such rapid development in something that possibly can make us other immortal or remove us as something out of use?

For example, genetic engineering always was one of the most debatable branch of bioengineering.

“Practical ideas, probably, will overweight moral and cloning of humans is about to be given a green light. Analysts forecast, that already in first 10 years of existence turnover of the cloned transplants industry will be not less than 3.8 billion dollars [4]”.

According to this, sooner or later, but we will finally come to the things, which are unethical for us right now, but won't be so in the future, especially in comparison with other opportunities we will have.

However, sometimes the reason for ignoring or decreasing of moral standards is more about science than about benefit. There is impossibility of leading many scientifically significant researches due to them being unethical from the first look.

For example, the brain and its functions research has only started interacting with bioengineering, but has already faced impossibility of some essential researches because of their unethical look to the society. Moreover, the problem is not only about "look", but also about the point, that these researches have to include human experiments. But the memories of humanity is still too fresh and we all remember, that despite the fact, that some researches of the XX century have given us some fundamental knowledge, their cruelty incomparable to anything.

And that is also a reason why we don't use all the achievements we have access to today: "Intuition tells us, that if the information was obtained in unethical way, but we still use it, then we become accomplices of what has happened in the past", - these words belong to Dom Wilkinson, the specialist of medical ethics from Oxford university, and he explains why in most of the cases we simply can't allow ourselves use those scientific achievements.

So finishing with this question on this point we go further, because developing human-helping spheres we should not also forget about nature-protecting researches. Today bioengineering is already applied to solving some environmental problems, such as foaming in wastewater treatment and applying biology for environmental sensing. This researches not only help to deal with some ecological problems, but also make them somewhat cheap for implementing and again decreasing some risks for human health. Moreover, some ideas connected with integrating synthetic biology and metabolic engineering in solving environmental problems are still in development, but already look promising [5].

There is another big difficulty in the modern scientific world, which also partly deals with bioengineering is food science. In this field bioengineering is only slightly used and mostly just planned to be applied to some researches, but it can prove once again the multipurpose potential of bioengineering field.

To conclude with, bioengineering – is one of the most prospect and fast growing scientific field, which interacts with mostly every direction of classical science. As we can see, probably, it should be given a bit more freedom. Because as long as it deals with the general, undoubted directions and helps to succeed on the way to sustainable development goals, it also tries to represent us something totally new and unknown till now, but sometimes it's methods or ideas are too far from what we used to, however it would be great to accept them.

In addition, even though the word combination "human experiments" still sounds terrifying for most of us, Covid-19 break out, for example, has shown us, that sometimes such ways are unavoidable. The essential point here is not to forget again, that such experiments have to be based only on volunteering and consider human's life as the priority over everything else.

References

1. *Bioengineering: [Electronic resource]. – URL: <https://www.britannica.com/technology/bioengineering>.*
2. *Евтушенко, А. Н. Введение в биотехнологию / А.Н. Евтушенко, Ю. К. Фомичев. – Минск, БГУ.*
3. *Биоинженерия: обзор научных достижений за последние пять лет: [Electronic resource]. – URL: http://www.zen.yandex.ru/media/id/5d91016bd7859b00b1181c48/bioinjning-obzor-nauchnyh-dostizhenii-za-poslednie-piat-let-5e9cebcc92055a0c646ed620?utm_source=serp.*
4. *Россихин, В.В. Биотехнология: из прошлого в будущее / В.В. Россихин, А.А. Яремчук. – Минск, Тонтик. – 2005. – 240 с.*
5. *Bioengineering and the environment: [Electronic resource]. – URL: <https://chemical.eng.unimelb.edu.au/gras/bioengineering>*