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# GLOBAL TECHNOLOGICAL TRANSFORMATIONS AND GLOBAL FUTURE

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**The presentation introduces new explanatory conceptions - the theory of production revolutions - which are relevant to the analysis of causes and trends of global shifts in historical process and which give opportunities to make some forecasts for the future.**

## The production revolution can be defined as


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*a radical turn in the world productive forces connected with the transition to a new principle of production not only in technologies but also in the sphere of interrelations between society and nature.*

According to our theory, the historical process can be subdivided more effectively into *four major stages*.

The transition from one stage to another can result in the change of all basic characteristics of the respective stage.

We propose to consider the *production revolutions* as conventional borders between these stages, by means of which the chronology may be worked out in detail.



Of all various technological and production changes that took place in history the most profound and universal consequences for society were held by three revolutions:

- ❑ **the Agrarian (or Neolithic)**
- ❑ **the Industrial**
- ❑ **the Information-Scientific.**

# AGRARIAN REVOLUTION

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Its result is the transition to regular food production and on this basis – to a complex societal labour division.

This revolution is also connected with employment of new energy resources (animal's power) and materials.

# INDUSTRIAL REVOLUTION

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The Industrial Revolution led to the concentration of main production in industry.

The importance of this revolution consists in the substitution:

- of manual work by machines,
- of the biological energy – by water and steam power.

It also introduced the process of labour saving in the wide sense (not only of physical labour, but also in the spheres of accounting, control, exchange, credit, information transfer).

# INFORMATION-SCIENTIFIC REVOLUTION

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Information-scientific revolution resulted in the emergence of powerful information technique and technology, as well as in the use of new materials and energy resources and the spreading of automation.

But the main results of this revolution are still forthcoming.

## **The Distinction between the Production Revolution and Various Technical Overturns**

- It touches not only some separate essential branches but the economy on the whole.
- Such an overturn involves into the economical circulation some fundamentally new renewable / long inexhaustible widespread resources.
- It rises labor productivity or land carrying capacity by orders of magnitude.
- It increases by orders volume of production and promote demographic revolution.

Every production revolution can be regarded as a starting point of a new radical turn in the world productive forces which we name a *production principle*.

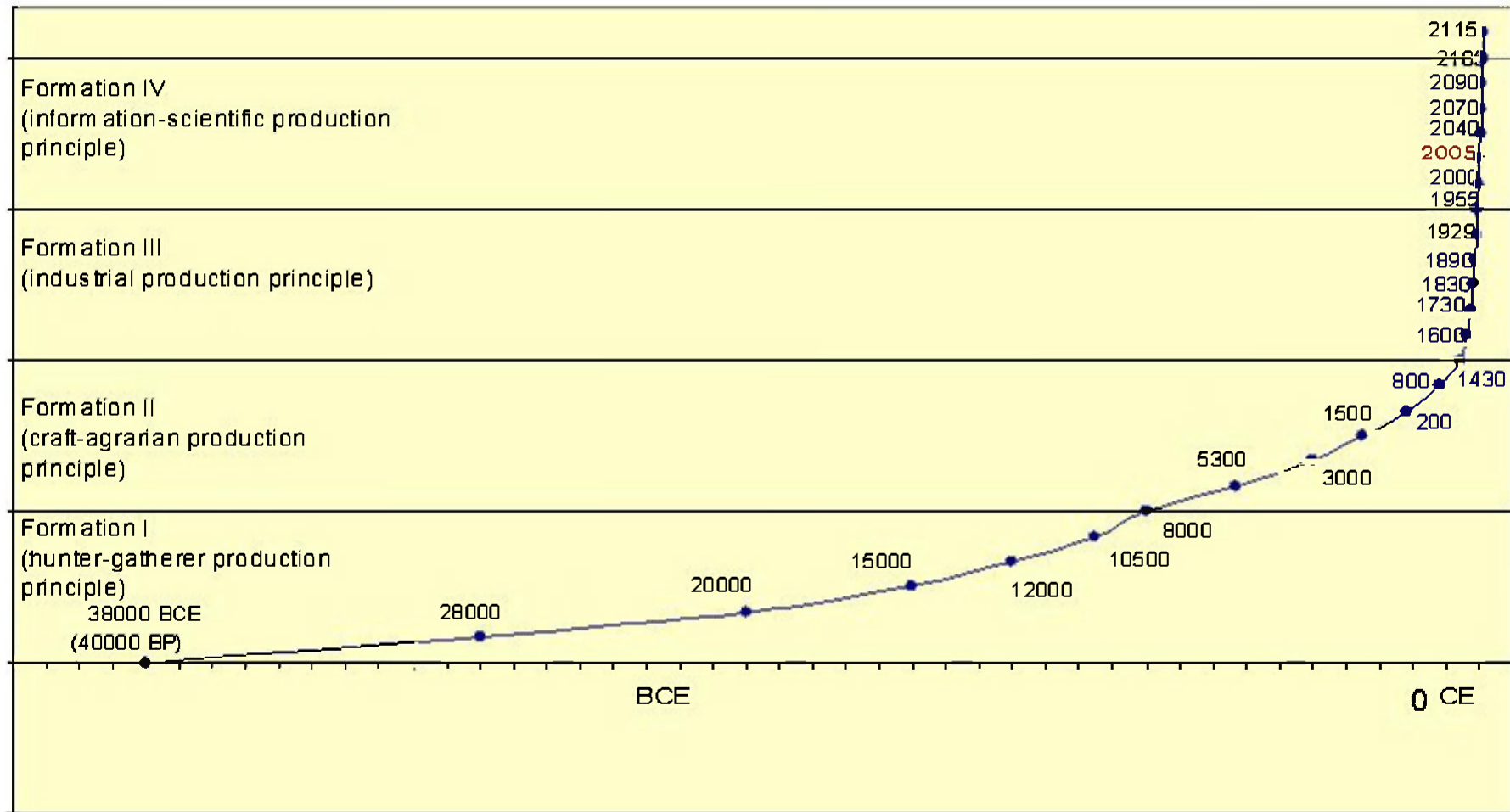
We single out **four production principles**:

1. Hunter-Gatherer
2. Craft-Agrarian
3. Industrial
4. Information-Scientific

## Table 1. Chronology of Production Principle Phases

| <i>Production principle</i>          | <i>1<sup>st</sup> phase</i>                                  | <i>2<sup>nd</sup> phase</i>                                | <i>3<sup>rd</sup> phase</i>                                  | <i>4<sup>th</sup> phase</i>                                 | <i>5<sup>th</sup> phase</i>                                 | <i>6<sup>th</sup> phase</i>                               | <i>Overall for production principle</i>                    |
|--------------------------------------|--|--|--|---|---|---|--|
| <b>1.<br/>Hunter-Gatherer</b>        | 40 000–<br>30 000<br>(38 000–<br>28 000<br>BCE)<br><b>10</b> | 30000–<br>22 000<br>(28 000–<br>20 000<br>BCE)<br><b>8</b> | 22 000 –<br>17 000<br>(20 000–<br>15 000<br>BCE)<br><b>5</b> | 17000 –<br>14 000<br>(15 000–<br>12 000<br>BCE)<br><b>3</b> | 14 000–<br>11 500<br>(12 000–<br>9500<br>BCE)<br><b>2.5</b> | 11 500–<br>10 000<br>(9500–<br>8000<br>BCE)<br><b>1.5</b> | 40 000–<br>10 000<br>(38 000–<br>8000<br>BCE)<br><b>30</b> |
| <b>2.<br/>Craft-Agrarian</b>         | 10 000–<br>7300<br>(8000–<br>5300<br>BCE)<br><b>2.7</b>      | 7300–<br>5000<br>(5300–<br>3000<br>BCE)<br><b>2.3</b>      | 5000–<br>3500<br>(3000–<br>1500<br>BCE)<br><b>1.5</b>        | 3500–<br>2200<br>(1500–<br>200<br>BCE)<br><b>1.3</b>        | 2200–<br>1200<br>(200<br>BCE –<br>800 CE)<br><b>1.0</b>     | 800–<br>1430 CE<br><b>0.6</b>                             | 10 000–570<br>(8000 BCE–<br>1430 CE)<br><b>9.4</b>         |
| <b>3.<br/>Industrial</b>             | 1430–<br>1600<br><b>0.17</b>                                 | 1600–<br>1730<br><b>0.13</b>                               | 1730–<br>1830<br><b>0.1</b>                                  | 1830–<br>1890<br><b>0.06</b>                                | 1890–<br>1929<br><b>0.04</b>                                | 1929–<br>1955<br><b>0.025</b>                             | 1430–1955<br><b>.525</b>                                   |
| <b>4.<br/>Information-Scientific</b> | 1955–<br>2000<br>(1955–<br>1995)<br><b>0.04–0.045</b>        | 2000–<br>2040<br>(1995–<br>2030)<br><b>0.035–0.04</b>      | 2040–<br>2070<br>(2030–<br>2055)<br><b>0.025–0.03</b>        | 2070–<br>2090<br>(2055–<br>2070)<br><b>0.015–0.02</b>       | 2090–<br>2105<br>(2070–<br>2080)<br><b>0.01–0.015</b>       | 2105–<br>2115<br>(2080–<br>2090)<br><b>0.01</b>           | 1955–2115<br>(2090)<br>[forecast]<br><b>0.135–0.160</b>    |

# Diagram 1. Evolution of Historical Process in Time



In our theory each production revolution has similar internal cycle with two qualitative phases and a sort of interruption between them.

- During the first phase the advanced technologies are worked out, later spreading to other societies.
- At the second phase a rapid flourishing of a new production principle takes place.

The scheme of two phases of production revolution within our concept looks as follows:

# AGRARIAN REVOLUTION

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- The **first phase** is the transition to *primitive hoe agriculture and animal husbandry starting from about 12–9 thousand years ago.*
- The **second phase** is the transition to *irrigation or non-irrigation plough agriculture starting from 5,5 thousand years ago.*

# INDUSTRIAL REVOLUTION

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- The **first phase** is a vigorous *development of seafaring and trade, mechanization on the basis of water engine* and other processes in the 15<sup>th</sup> – 16<sup>th</sup> centuries.
- The **second phase** is the *industrial breakthrough* (the 1760s–1830s) which is connected with introduction of various machines and steam energy.

# INFORMATION-SCIENTIFIC REVOLUTION

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- The **first phase** having lasted for almost forty years (from the 1950s to 1990s) is already over.
- However, it appears possible to speak about its forthcoming **second phase** which may start within a few decades.

# INFORMATION-SCIENTIFIC REVOLUTION

## FIRST PHASE

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The first phase has had a number of advanced trends:

- in power engineering,
- production of synthetic materials,
- automation,
- exploration of space, sea area and bottom,
- agriculture, medicine and a number of academic disciplines.

# INFORMATION-SCIENTIFIC REVOLUTION

## FIRST PHASE

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- However, the most significant changes have taken place in the sphere of information. Collecting, processing, and distribution, receiving and decoding (interpretation) of information have become a more important part of production.
- One can also notice a transition to scientific patterns in different spheres; the scientific research results have become a commodity in the sense of innovativeness.

## INFORMATION-SCIENTIFIC REVOLUTION INTERMEDIATE PERIOD

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After the first stage of the Information-Scientific revolution in the mid-1990s the **intermediate** (between two phase of production revolution) **period** started. It continues up to the present.

This period is characterized by a very rapid diffusion of technologies that appeared in the previous time. In the last two decades we observe development and wide diffusion of user-friendly computers, communication technologies *etc.*

## INFORMATION-SCIENTIFIC REVOLUTION FROM FIRST PHASE TO NEXT ONE

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At the first stage of the Information-Scientific revolution the saving of complex and intellectual work in production, management, information sector seems the most evident.

Although computerization, software engineering and new types of informational communications have become the leading trend today, yet the essence of this revolution can hardly be spoken about because *its major results are still ahead.*

# INFORMATION-SCIENTIFIC REVOLUTION

## SECOND PHASE

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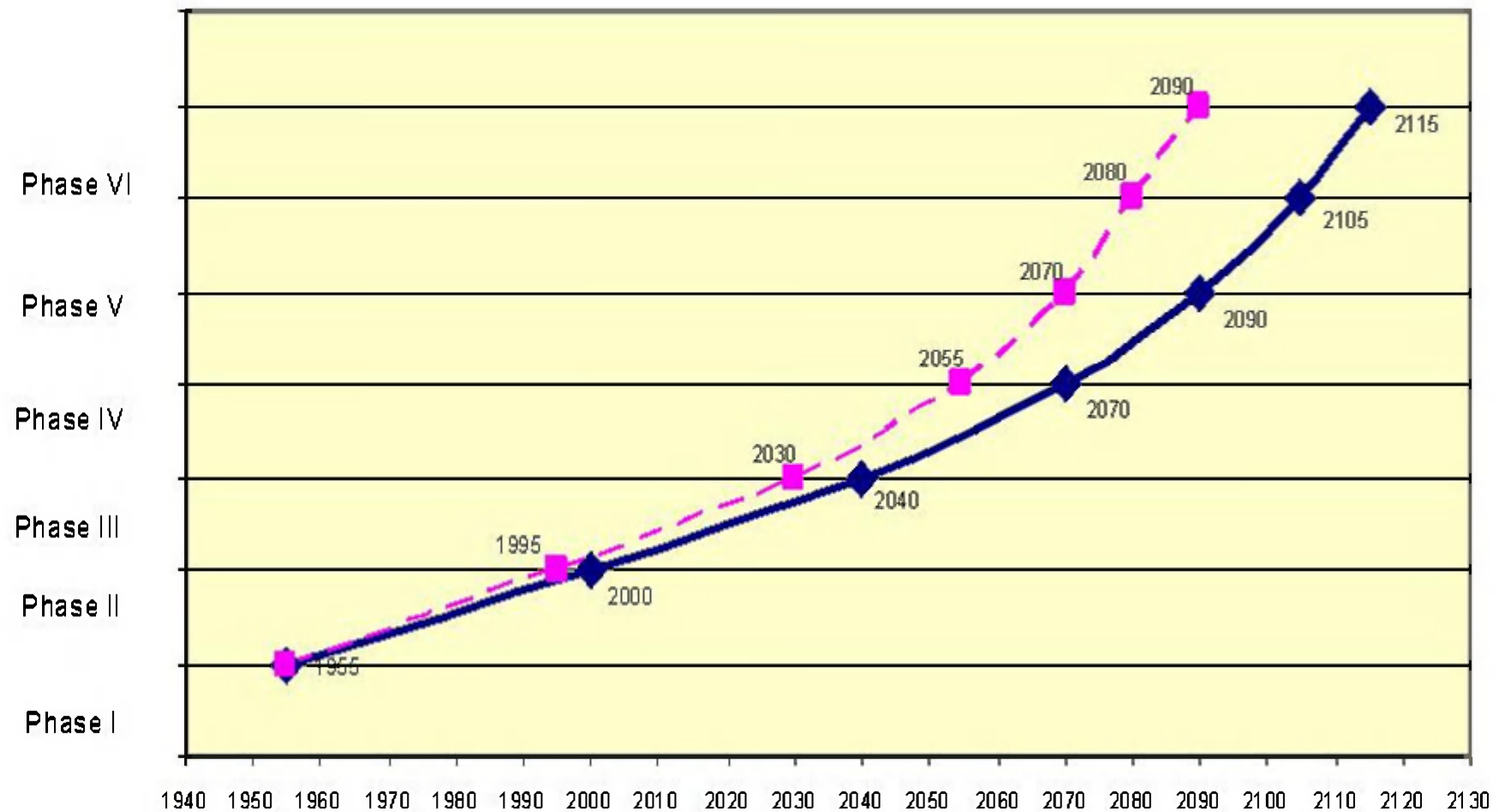
The second phase may start around the 2030–2040s. Judging from different contemporary achievements (in genetics, medicine, bionanotechnologies etc.), the second phase can start with a dramatic increase of opportunities to change human biological nature.

There is a great number of various suppositions concerning changes of that kind, they are dealt with by intellectuals in different fields starting from philosophers to fantasists.

**Table 2. Chronology of Information-Scientific Production Principle Phases**

| <i>1<sup>st</sup><br/>phase</i>  | <i>2<sup>nd</sup><br/>phase</i>  | <i>3<sup>rd</sup><br/>phase</i>  | <i>4<sup>th</sup><br/>phase</i>  | <i>5<sup>th</sup><br/>phase</i>  | <i>6<sup>th</sup><br/>phase</i>  | <i>Overall for<br/>production<br/>principle</i> |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|---|
| 1955–<br>2000<br>(1955–<br>1995) | 2000–<br>2040<br>(1995–<br>2030) | 2040–<br>2070<br>(2030–<br>2055) | 2070–<br>2090<br>(2055–<br>2070) | 2090–<br>2105<br>(2070–<br>2080) | 2105–<br>2115<br>(2080–<br>2090) | 1955–2115<br>(2090)<br>[forecast]               |
| 0.04–<br>0.045                   | 0.035–<br>0.04                   | 0.025–<br>0.03                   | 0.015–<br>0.02                   | 0.01–<br>0.015                   | 0.01                             | 0.135–0.160                                     |

## Diagram 2. Information-Scientific Production Principle



## Revolution of Controllable Systems

- Thus, given that historical process started with the Upper Paleolithic (human) revolution, it is not improbable that the new revolution will become “post-human”, whose result will be the epoch of active impact on human organism.
- Of course, there are possible some negative and even catastrophic scenarios which are abundant. If to consider some more optimistic variants, this revolution on the whole can become the revolution of controllable systems.

- The forthcoming **revolution of controllable systems** is the extensive development of abilities to intentionally influence and generally manage various natural and production processes. This means that this stage opens the direction that can be connected with new technologies to control the processes, which are uncontrollable today, in particular the biological ones.
- Let us believe that under favourable circumstances we will observe the emergence of new environmental remediation and nature-protection sectors of economy, which in the distant future can make natural processes controllable to a certain degree.

# Forecasts of World Political System Development

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- The contemporary world crisis opened the period of a search for new political forms, so, in our opinion, it will be the time of quite rapid and unexpected political transformations, and of new, but often short-life supra-national alliances and unions including the attempts to control the relations on the global scale. We called this supposed period “the epoch of new coalitions”.

## Forecasts of World Political System Development

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- This epoch may last for the nearest two-three decades. From the above said, it follows that with the beginning of the second phase of the Information-Scientific revolution (i.e. in the 2030–2040s) there may start an institutionalization of international relations and primary forms of regulation of the most important economic problems.

## Forecasts of World Political System Development

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- After the Information-Scientific revolution (the revolution of controllable systems) finishes, there will start a real political integration (in quite unclear forms yet) of the world political structures.
- This means, that there will start not a globalization (the extensive process in its essence and hence a finite one) but a real systemic integration of the humanity (of course, within an optimal scenario).



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**Thank you for attention!**