

# Methodologies on Scientific Researches: An Overview and Future Direction

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**Abstract--** In allusion to the history and actuality of human scientific researches, this paper systematically summarized the methodologies of scientifically exploratory researches and the obtained scientific achievements, as well as detailedly presented the shortcomings of scientific researches and the future direction of scientific research. Firstly, human ancestors and humans did inexhaustible explorations in the multidimensional physical environments of the day, where they existed and developed. The obtained gigantic achievements could sustain human ancestors and humans to unceasingly withstand exhaustless crucifixions, then exist and evolve into the modern humans. However, there are still some shortcomings in scientific researches, which are presented as follows: ① Human scientific researches just come down to the skin-deep phenomena of universal substances and their motions, and scientific achievements make up of tremendous, temporarily efficacious and experiential knowledge base, most of which are going to lapse and invalidate along with the changes of multidimensional astrospace environments. Until now humans all along get about in the labyrinth: 【 Forevermore ceaselessly repeat [ Find new unknown phenomena → Select exploratory objects from the unknown substances and their characteristics → By using all possible methodologies of scientific explorations and researches, inexhaustibly explore unknown phenomena → Obtain new discoveries, new concepts and new momentous breakthrough theory, which are egregiously and stupendous → Chronically, extensively and practically proof-test and applied in engineering → Find new unknown phenomena → ... ] . ② There are some man-made factors in scientific researches, and scientific research methodologies with human features are formed, that is, all considered factors are just the one which can be suppositional, apprehensible and measurable by all possible technological means and equipments; Synchronously, the primary, lesser and potty factors are considered, the absolutely neglectable and wondrously jerkwater factors are ignored. Finally, this paper suggests: The future direction of scientific research is to search out the most original fundus of universe substances and then freely use all substance in the whole universe; The future methodology of scientific researches are the systematically inverse design of universe substance, based on the tremendous knowledge base which are chronically obtained and accumulated by humans, as well as the numerical universal calculation algorithm for universe substances and their running. This is the methodology of scientific researches for humans to full out achieve the final

research purpose by paying out the minimum expenses.

**Index Term--** Methodology of scientific researches, exploration and new discovery, shortcomings in scientific researches, future direction of sciences, inverse design of substance

## 1. INTRODUCTION

The purposes of human scientific researches are the requirements of human existences and developments. Human ancestors and humans have ceaselessly explored and researched on the unknown natural phenomena around themselves of the day, from the time when the ancestor appeared and existed up to the present. The research profundity and scope gradually and ceaselessly expand, the great researchful achievements are countless, which are mainly incarnated as: Human ancestors and humans came through incomputable survive or perish circumstances on the Earth which is the natal cunabula of humans, and now humans are gradually going to occupy and control the Earth. Humans expect to little by little occupy and control the whole multi- Dimensional astrospace, as well as freely use all substances which permeate the whole multi-D astrospace<sup>[1]</sup>, implement the final purpose of human scientific researches.

Scientific research is defined as: Based on the substance conditions of the day, human subsistence and development environments, as well as the base of the obtained sciences and technologies, researchers use all possible scientific and technological methodologies to explore all multifarious unknown impersonality phenomena regarding on the universal substances and their running process, looking forward to exploring new discoveries. Then the new discoveries can be practically proof-test by various subjects and various ways under different circumstance conditions, and widely applied in engineering. Based on the developing history of human scientific exploratory researches<sup>[2-6]</sup>, it is obvious that the exploring researches on the unknown phenomena and their characteristics ceaselessly developed starting from zero; the scientific and technological researches advance rapidly developed since modern time, and new 'Future scientific problems' continuously appear<sup>[7]</sup>. It is noticeable that human ancestors and humans (such as primitives, monkeys, ....., animalcules, .....) ceaselessly did scientific exploration researches, otherwise, humans could not ceaselessly exist,

grandly developed and evolve into nowadays humans. Scientific exploration researches not only the scientific activities in laboratories by scientists, but also include all activities for exploring unknown phenomena in anyplace in anytime by any .....

The methodologies of scientific exploratory researches are the thought keys of scientific researches, which can be used to explore and research on the unknown substance phenomena, as well as predominate and use the corresponding universe substances. Therefore, many researchers work over the methodologies of scientific exploratory researches from different technological approaches and points of view<sup>[2,3,8-11]</sup>. The methodology of scientific exploration and research is basically determined by the following factors: the selected purpose of scientific exploration and research, the correlative bases of the existing sciences and technologies, the living substance environments in a multidimensional astrospace, and other conditions. Actually, the methodologies of scientific explorations and researches are usually created as following: To better and better exist and develop, based on the living substance environment, as well as all correlative science and technology of the time, the researchers design the optimal methodology if it is higher probability to obtain the new discovers. The methodologies of scientific explorations and researches can not be reduced to invariable, general and detailed operation processes, but can be the corresponding philosophic theories. From of old, all kinds of scientific exploratory researches start from the real and idiographic problems which are concretely explored and researched. To ceaselessly upgrade the validity and efficiency of the scientific researches, the methodologies of scientific researches are improved along with the incessant developments of multitudinous subjects, the new concepts, new approaches and new methods of the scientific researches continually come forth. It takes note of the following problems:

What kinds of methodologies are used by humans for scientific explorations and researches? What are the strongpoints and shortcomings?

If humans continuously use the methodologies which are used from of old, can human achieve the final purpose of scientific researches? When the final purpose of the researches can be achieved? What is the methodology of exploration and research which can be used by human to achieve the final purpose as soon as possible and paying out the minimum expenses?

Based on the universal numerical algorithm and numerical simulation courses of original running for the whole universe substances<sup>[1]</sup>, considering the final purpose of scientific explorations and researches on substances in our human subconsciousness, this paper systematically and roundly summarized methodologies for scientific explorations and researches. The paper also presents the strongpoints and shortcomings of the scientific research methodologies, as well as the future direction of the methodologies. The future methodology for scientific explorations and researches is the inverse design of the

whole universe substance system, which can carry out the final purpose of humans: To occupy, control and discretionarily utilize the whole universe multidimensional space and all kinds of universal substances.

## 2. THE OBJECTS SCIENTIFICALLY EXPLORED AND RESEARCHED BY HUMANS: SUBSTANCE STRUCTURES AND THE CHARACTERISTICS OF RUNNING PROCESS IN THE WHOLE UNIVERSE

The objects scientifically explored and researched by humans are as following: humans absolutely, inside out, by rule and line, unfailingly and subtly search out substance structures in the whole multidimensional astrospace, their running processes and the characteristics, as well as inner parameters of multidimensional space and substances, ... .. Regarding on substance structures, the general essential principles of substance running process, as well as their general numerical algorithm of substance running processes<sup>[1]</sup> are presented as follows:

### 2.1 Substance structures and the running processes in the whole universe

The astrospace S is a  $N_S$ -Dimensional space. The size of this space is  $A_1 \times A_2 \times A_1 \times \dots \times A_{N_S}$ , where  $A_i$  ( $i=1,2, \dots, N_S$ ) is the size of the  $i^{\text{th}}$ -D space ( $A_1$  is time,  $A_2, A_3, A_4$ , are 3-D geometry physics space, ... ..). The universe is made up of a series of (total  $N_{\text{Max}}$  kinds) substance basic elements (SBE) and combined substances (CS). The SBEs are the rock-bottom basic elements in the whole universe, CSs are transformed from SBEs and lower level CSs. Those SBEs and all levels of CSs (including all kinds of CSs) are ceaselessly running, and ceaselessly transforming each others. These ceaseless running and transforming each others are presented as Figure 1. The  $N_S$ -Dimensional moving processes are presented as Figure 2 for all levels and all kinds of CSs. The variational process of causality logic for the running processes of a great deal of hierarchy levels and kinds of combined substances in  $N_S$ -Dimensional space are presented as Figure 3. The multitudinous kinds of anterior phenomena are the conditions of a latter phenomenon, and a latter phenomenon is the result which caused by collectively coordinated oppositions of multitudinous kinds of anterior phenomena.

The processes of  $N_S$ -D antagonistic running of substance structures in the whole universe, and the substance structures created from the  $N_S$ -D antagonistic running keep to the general running essential principles of universal substances. The detailed results of substance running processes in the whole universe can be numerically simulated by the general numerical algorithm of substance running process.

### 2.2 The general essential principles of substance running process

The general running essential principles of all universal substances are as follows:

General principle I: All universal substances are ‘self-serving’, their instincts are forevermore pursue respective benefit performance indexes.

General principle II: The basic benefit performance indexes of all universal substances are maximizing the  $N_S$  ( $N_S > 4$ ) dimensional roomage which the substance is holding (is controlling):

$$\max[\Delta t \Delta x \Delta y \Delta z \dots \dots] \quad (1)$$

|----- $N_S$  Variables----->

The  $N_S$  -Dimensional space means: time, 3-D geometrical space,  $\dots \dots$ . The basic benefit performance indexes include multitudinous sub- indexes. In all possible environments of universal substance antagonistic motions, the basic benefit performance index (1) should be globally maximized considering all possible situations, such as the selection of the sub-indexes, treating with all intangible motion restrictions, etc.

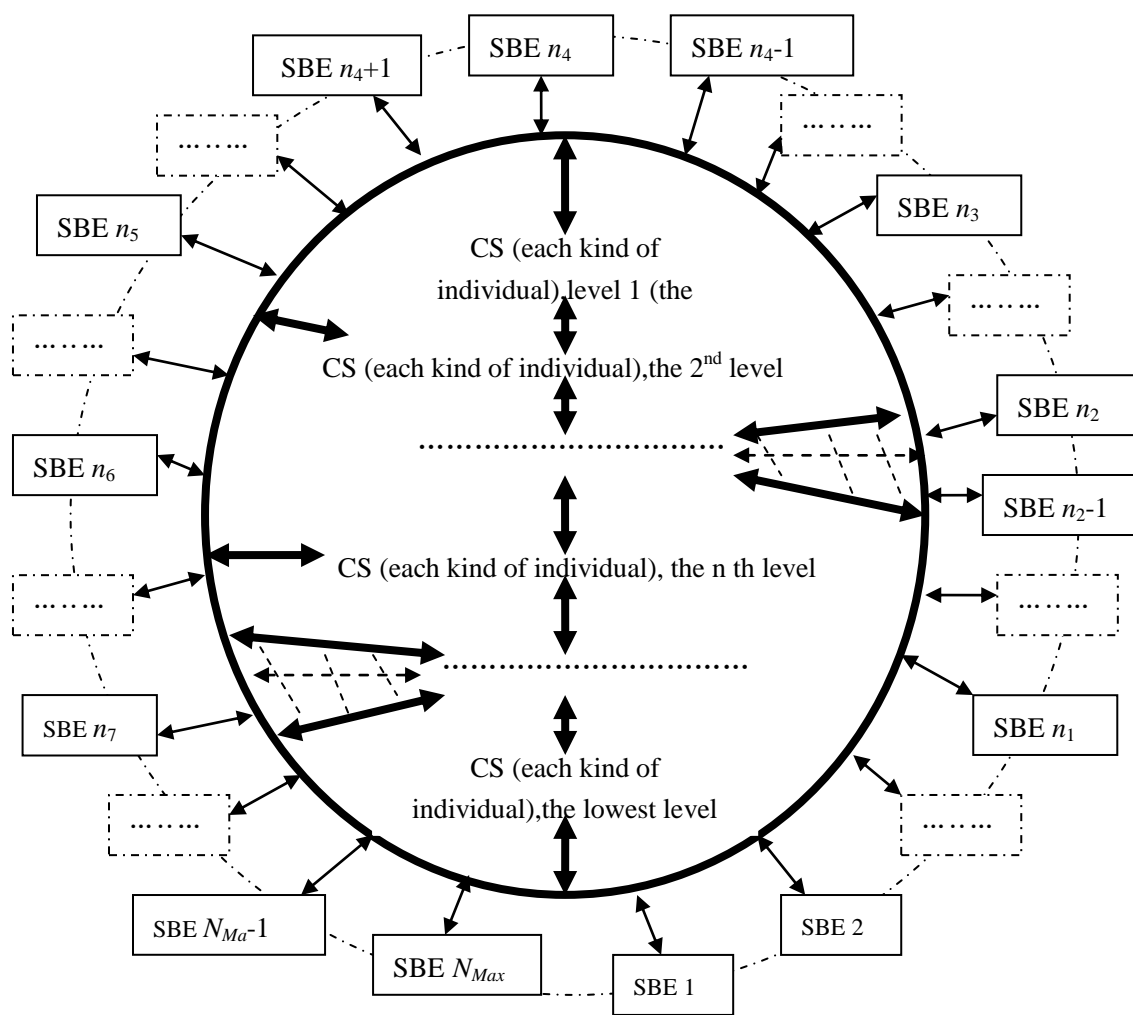


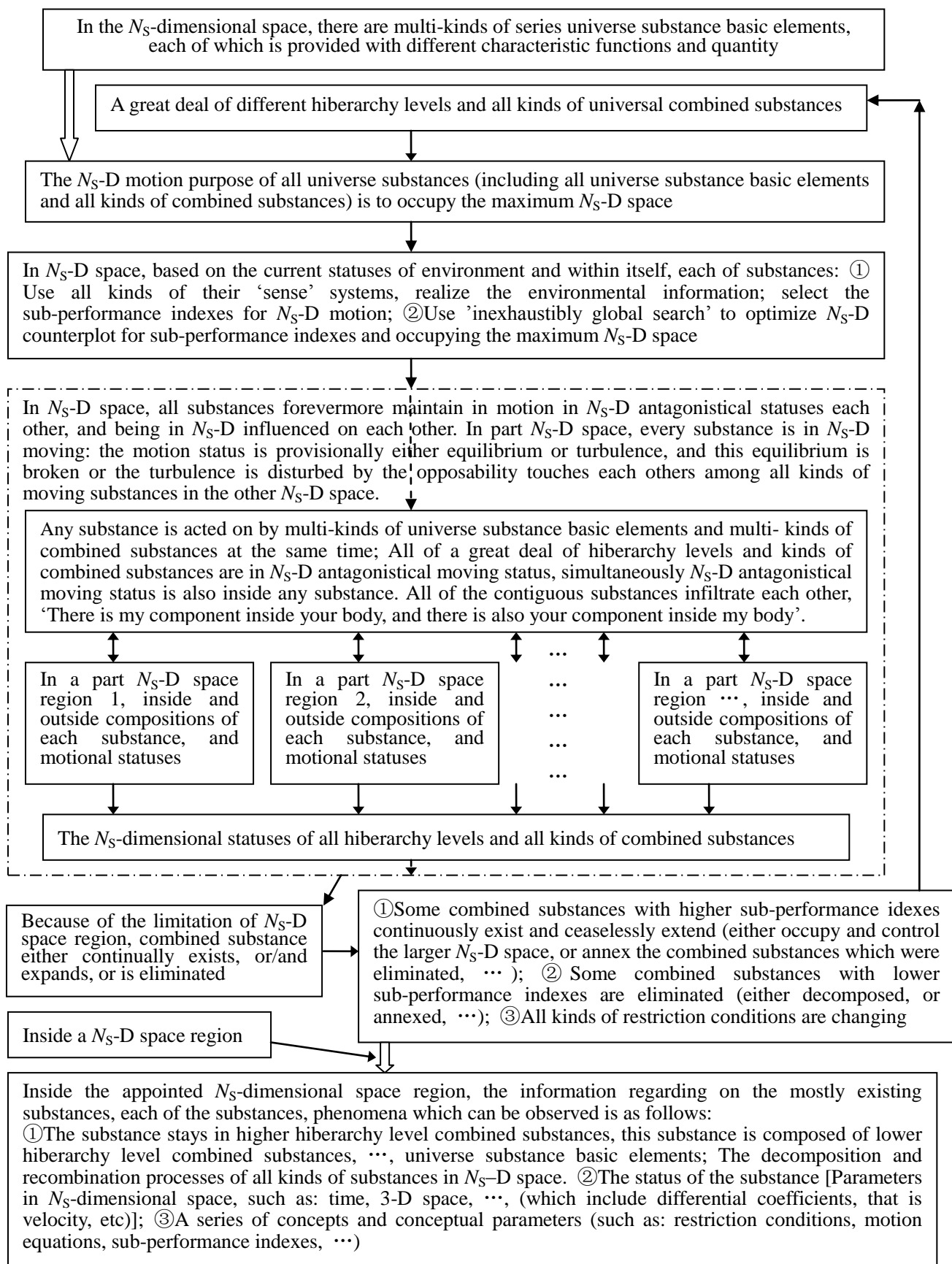
Fig. 1. Multi-kinds of universe substance basic elements (SBE) engender multi-kinds of combined substances (CS). The universe substance units and a great deal of hierarchy levels and kinds of combined substances are transforming each other for pursuing their benefit indexes.

General principle III: The whole  $N_S$ -Dimensional space is fully imbued with all levels and all kinds of universal substances. In the  $N_S$ -D space, the universal substances directly touch and act on each other. In the whole  $N_S$ -Dimensional cosmical space, there is no ‘vacuum’ where no substance can be found. The definition of universe is the  $N_S$ -Dimensional space where fully imbued with substances.

General principle IV. All levels and all kinds of universal substances have ‘sensorial’ and ‘observational’ systems, ‘reminiscence’, as well as ‘high intelligent ideation’. All kinds of universal substances always and ceaselessly do

in-depth researches on their multi-Dimensional living environments, and each kind of substances has exploring methodologies with its features.

General principle V. In the  $N_S$ -D space all levels and all kinds of universal substances are promiscuous together each others, they share in the same  $N_S$ -D space together, they are an same substance, as well as they are also the different and reciprocally antagonistic substances; the running environment of each combined substance ceaselessly changes in the random, unknown, inexactly forecasted and unforeknown way.

Fig. 2. The  $N_S$ -Dimensional running process of universe substances

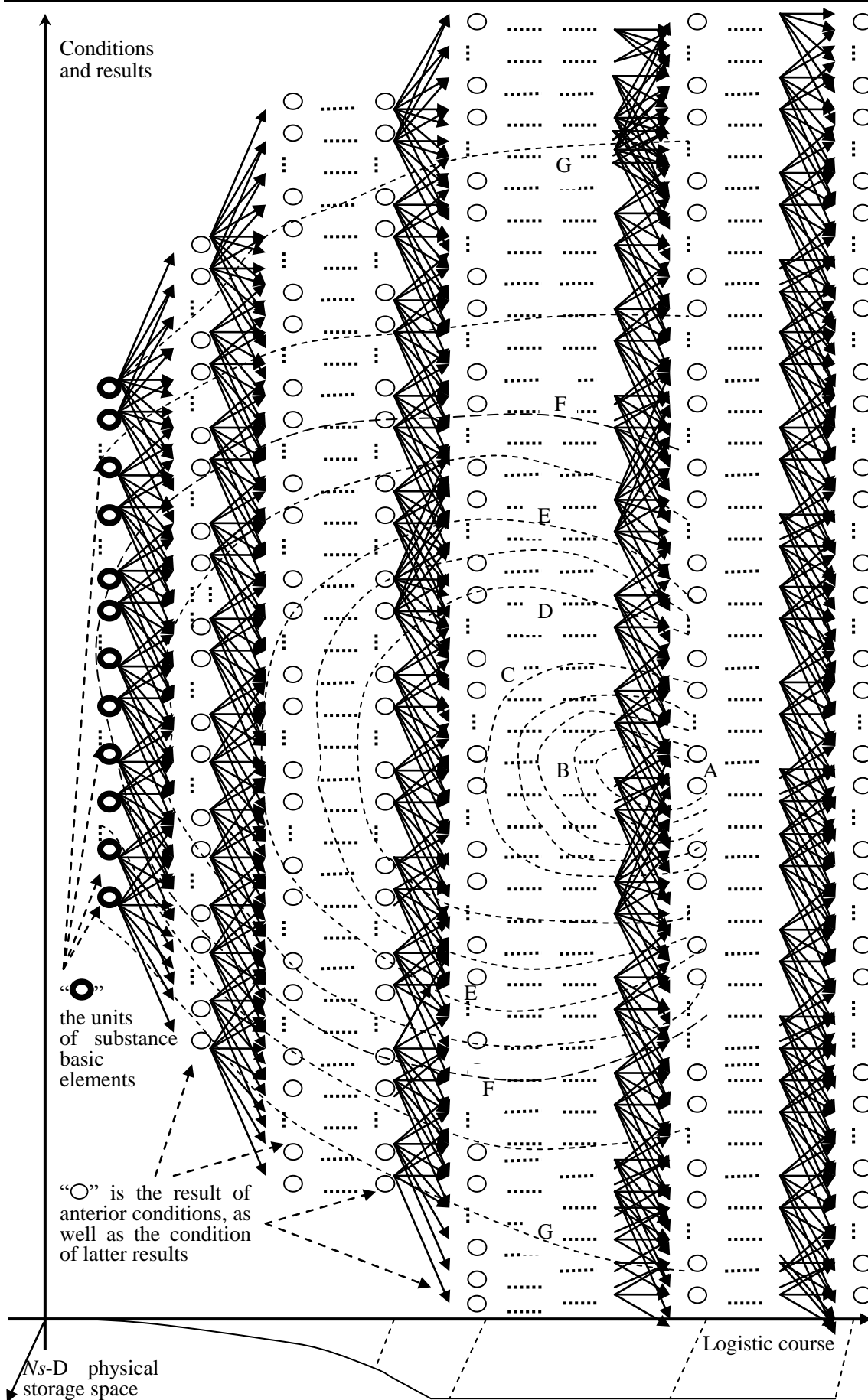


Fig. 3. Variational process of causality logic for the running process of a great deal of hierarchy levels and kinds of combined substances in  $N_s$ -dimensional space, the relationship between the anterior phenomena (conditions) and the latter phenomena (results) in the logic



General principle VI. Every universal substance search all possible countermeasures under the conditions of the  $N_S$ -D statuses inside and outside environments: To pursue the benefit performance indexes, the SBE units and combined substances respectively employ all possible ploys and their characteristics by fair means or foul, the oppositional and coordinated motions in  $N_S$ -D space are carried through with other SBE units and combined substances.

General principle VII. The power energy sources of universal substances come from: Because all universal substances are respectively maximizing the  $N_S$  ( $N_S > 4$ ) Dimensional roomage for each oneself, the disequilibrium distributions of the universal substances in the  $N_S$ -D space bring on dissimilar 'intensity of pressure'; And all universal substances ceaselessly run in the  $N_S$ -D unpeaceful states, because substances forevermore rivalize to maximize  $N_S$ -D space in confusion and out-of-order incapacious lacunes. In these confusion and out-of-order incapacious lacunes, the dissimilar 'intensity of pressure' created by unpeaceful running states of  $N_S$ -D rivalries is power energy sources.

General principle VIII. The invisible  $N_S$ -D restrictions effect on the running of all universal substances: The universal substance is punished or eliminated with corresponding grade if the substance violates the invisible restriction conditions in a certain extent; These restrictions are the characteristics which relative to the universal substances, they also are experiential formulae by artificially observational statistics; All kinds of restriction conditions change, such as being created, remodeled, disappeared, quantitatively altered and so on, based on the alterations of  $N_S$ -D motional statuses of all levels and all kinds of universal substances as well as antagonism equiposes among all levels and all kinds of universal substances.

General principle IX. Everlasting decomposition and combination: To pursue respective benefit performance indexes, the decomposition and combination motions of all universal substances are unending. These everlasting decomposition and combination bring on the limited life-span for all levels and all kinds of universal substances  $N_S$ -D space.

General principle X. There is no eternally changeless status: In the  $N_S$ -D space, there are no eternally changeless status and performance indexes. Each substance is acted on by multitudinous levels and many kinds of substances at the same time together, synchronously this substance also acts on the other multitudinous levels and many kinds of substances.

General principle XI. Either continuously exist (or/and expand) or being eliminated: In the  $N_S$ -D space, the running phenomena of all kinds of universal substances cannot be enduringly exist and hold the line, their statuses consecutively and all along are in the process: 'naissance of new substance and coming into being'  $\rightarrow$  either evolutionary or recessionary 'development', that is, either continuously and temporarily exist (or/and extend) or being eliminated  $\rightarrow$  'decomposition' or (and) 'combining with other substances'  $\rightarrow$  'naissance of new substance and coming into being'  $\rightarrow \dots$

General principle XII. All kinds of universal substances can be recombined and transformed each other inside every sub-space or striding over multidimensional sub-spaces in the  $N_S$ -D space, which create corresponding physical phenomena;

General principle XIII. Mass quantity is immutably imperishable. In the  $N_S$ -D space, a substance shows itself as different modalities and structures as well as different motions; Energies are some kinds of characteristic phenomena which are created by the directly collision motions among different levels and different kinds of universal substances, and these collision motions may form the other kinds of universal substances.

General principle XIV. Alternating multi-characteristics of universal substance: In the  $N_S$ -D space, the same universal substance possesses different characteristics in different dimensional space; The observation systems with different kinds of concepts observe the same phenomenon, but obtain the different information characteristics; Sometimes, those multi-characteristics are 'self-contradiction', 'cannot justify themselves'.

General principle XV. All substances are always in multidimensional and oppositional statuses each other based on half- information. In the  $N_S$ -D space, substances of all levels and all kinds are always in multidimensional and oppositional statuses each other based on half-information. The substances with different functions are respectively in dissimilar multidimensional space environments, they can only respectively taste a part of whole information which acts on themselves from a great deal of other substances., and the other information can not be tasted by themselves. Therefore, the opposed motions among substances are based on the half-information which is a part of the whole information around the substances, and tasted by the substances selves.

General principle XVI. The inexhaustible phenomena are created by the running of all universal substances in the  $N_S$ -D space, and these phenomena can be cursorily described and numerically simulated with a certain extent by using the experiential formulae which are the various sciences developed by humans from of old, but can not obtain the acoupsur results by the simple and convenient ways for all universal substances in the  $N_S$ -D space.

### 2.3 The general numerical algorithm of substance running process

Based on the general principles of universal substances system, inside the region  $\tilde{\mathcal{V}}_S^N$  in the  $N_S$ -D space, the universal numerical algorithm  $\bar{M}_{\text{Universal}}$  for original running of all universe substances is as follows:

$$\begin{aligned}
 & [A, \Delta, \Pi, \tilde{\mathcal{S}}, \tilde{\mathcal{S}}, \tilde{g}_{\alpha, \delta, \eta}, \tilde{C}_{\bar{x}}, \tilde{C}_{\bar{y}}, \tilde{C}_{\bar{z}}, P, \bar{U}(t), \bar{H}, \tilde{\Theta}; \\
 & N_{\nabla, \text{Max}}, N_{\nabla, k, \text{Max}}, A_{\nabla}, \Delta_{\nabla}, \Pi_{\nabla}, \tilde{\mathcal{S}}_{\nabla}, \tilde{\mathcal{S}}_{\nabla}, P_{\nabla}, \tilde{\chi}_{\nabla, \alpha, \delta, \eta}, \dots] \\
 & = \bar{M}_{\text{Universal}}(N_S, A_1, A_2, A_3, A_4, \dots, A_{N_S}, N_{\text{Max}}, N_{k, \text{Max}}, \\
 & \diamond, \Sigma_A, \bar{w}_{k, i}, \bar{C}_{\bar{w}}, \bar{f}_{k, i}, \bar{u}, \bar{J}; \tilde{\mathcal{V}}_S^N, \dots)
 \end{aligned} \tag{2}$$

where, the functions of the universal numerical algorithm  $\vec{M}_{\text{Universal}}$  of all universe substances are as following: input the total number and size of space dimension, parameters of SBE units which permeate in the whole universal  $N_S$ -D space, as well as the determined universal subspace, and so on; after the  $\vec{M}_{\text{Universal}}$  running which means the  $N_S$ -D opposition motions of the all SBE units and all kinds and all levels of the CSs, output the following information: There are inexhaustible (huge amount) phenomena which are boundlessly abstruse, may be any grotesque circs, ..., in the whole universal  $N_S$ -D space.

Regarding on the universal numerical algorithm  $\vec{M}_{\text{Universal}}$  for original  $N_S$  -Dimensional running of all universe substances, the concretely and detailedly mathematic description, mathematic expression of numerical simulation, the overall computational process, the computational flow chart of numerical simulation and so on can be referred to Ref. [1].

The concrete inputs are as follows:

- (1) The dimension of astrospace is  $N_S$  -Dimension.
- (2) The sizes of each dimension for astrospace are respectively as:  $A_1$  is time,  $A_2, A_3, A_4$ , are 3-D geometry physics space, ..., the space  $N_S$ , which made up of a  $N_S$  -Dimensional space S.
- (3) The information of universe substance basic elements:
  - ① In the whole  $N_S$  -D region, there are totally  $N_{\text{Max}}$  kinds and series of universe substance basic elements, and there are different characteristic and amount for each of the SBEs, for example, there is  $N_{k,\text{Max}}$  units for the SBE  $k$  ( $k=1,2, \dots, N_{\text{Max}}$ );
  - ② There are totally  $\diamond$  categories of SBEs and totalled  $\sum_A$  units for all categories of SBEs in whole astrospace;
  - ③ Inner parameters: the inner parameters of SBE unit  $m_{k,i}$  are  $\vec{W}_{k,i}$ ;
  - ④ Restriction conditions: The restriction functions for the inner parameters of each kind of SBEs are  $\vec{C}_{\vec{W}}$ ;
  - ⑤ The functional motion equation  $\vec{f}_{k,i}$  for all kinds of SBE units, where,  $k$  is the SBE  $k$  ( $k=1,2, \dots, B_{\text{Max}}$ ), and  $i$  is the SBE unit  $i$ ;
  - ⑥ The control variables  $\vec{u}$  for the SBE unit;
  - ⑦ The performance index  $\vec{J}$  of the SBE unit is to pursue predominating the maximum  $N_S$ -D space and all of substances in this space.
- (4) Determine a  $N_S$  -Dimensional universal subspace region  $\vec{V}_S^N$ .

The concrete outputs are as follows (In the whole  $N_S$  -Dimensional astrospace):

- (1) The macro information of all substances: ① The total level number of all combined substances  $\vec{A}$ . ② The total kind number of all levels of combined substances  $\vec{\Delta}$ . ③ The total number of all kinds and levels of combined substances  $\vec{\Pi}$ .

- (2) The detailed information of all kinds of substances (including SBE units and combined substances):
  - ① The statuses  $\vec{\mathfrak{Z}}(t)$  of all kinds of SBE units, the statuses  $\vec{\mathfrak{N}}(t)$  of all kinds and levels of combined substances. These statuses include the parameters in the  $N_S$  -D space, such as: time, 3-dimensional geometry space, ..., the derivatives among the above parameters, such as velocity and so on.
  - ② The motion equations of combined substance,  $\vec{\mathfrak{G}}_{\alpha,\delta,\eta}$ , the level number ( $\alpha$ ) of combined substances, the  $\delta$  (th) category, the  $\eta$  (th) combined substance.
  - ③ A serial of concepts and conceptual parameters are educed for the substances, **【**such as: restriction conditions which include the restriction functions  $\vec{C}_{\vec{X}}$  for the status variables of SBE units and combined substances, the restriction functions  $\vec{C}_{\vec{U}}$  for control strategies, the restriction functions  $\vec{C}_{\vec{J}}$  for performance indexes, motion equations, sub-performance indexes, ... **】**.
  - ④ The performance indexes  $P = [\vec{J} \quad \vec{\beta}]^T$  for all kinds of SBE units and all possible levels and kinds of combined substances, such as  $N_S$  -D space occupied by the substance; the substance shapes vary with  $N_S$  -D space, which can be observed by humans in the different conditions, the observed results of these shapes are different because of the different observation conditions, and so on.
  - ⑤ Control variables  $\vec{U}(t)$  for all kinds of SBE units and combined substances.
  - ⑥  $\vec{H}$  are the characteristic equations engendered by the interactions among substances,  $\vec{\Theta}(t)$  are the characteristic phenomena created by the interactions among all possible levels and kinds of combined substances around this substance (such as the SBE unit  $m_{k,i}$ ) in the  $N_S$ -D space region  $\vec{V}_S^N$  where the substance stays. These phenomena of multifarious characteristics for the substance are as follows: all kinds of interplay forces **【**such as universal gravitation, force in magnetic field, force caused by electricity, etc **】**, substance shapes, ...
  - ⑦ Each combined substance is inside some combined substances of higher levels, and this combined substance is made up of combined substances of lower levels and SBE units.
  - ⑧ The decompositions and

recombinations of all substances in the  $N_S$  -D motion processes. ⑨ All hierarchy levels and kinds of combined substances respectively optimize the performance indexes  $\vec{\beta}$  by each strategies  $\vec{\mu}(t)$ .

(3) In the determined  $N_S$ -D space region  $\tilde{V}_S^N$ , the existing substances and the phenomena information which can be observed are as following: ① There are totally  $N_{\forall,Max}$  kinds and series of universe SBEs, and there

are  $N_{\forall,k,Max}$  SBE units for each SBE respectively; ② The total level number of all combined substances is  $A_{\forall}$ , the total kind number for all levels of combined substances is  $\Delta_{\forall}$ , the total number of all kinds and levels of combined substances is  $\Pi_{\forall}$ , the statuses of all kinds of SBE units are  $\tilde{S}_{\forall}(t)$ , the statuses of all kinds and levels of combined substances are  $\tilde{S}_{\forall}^N(t)$ , and so on.

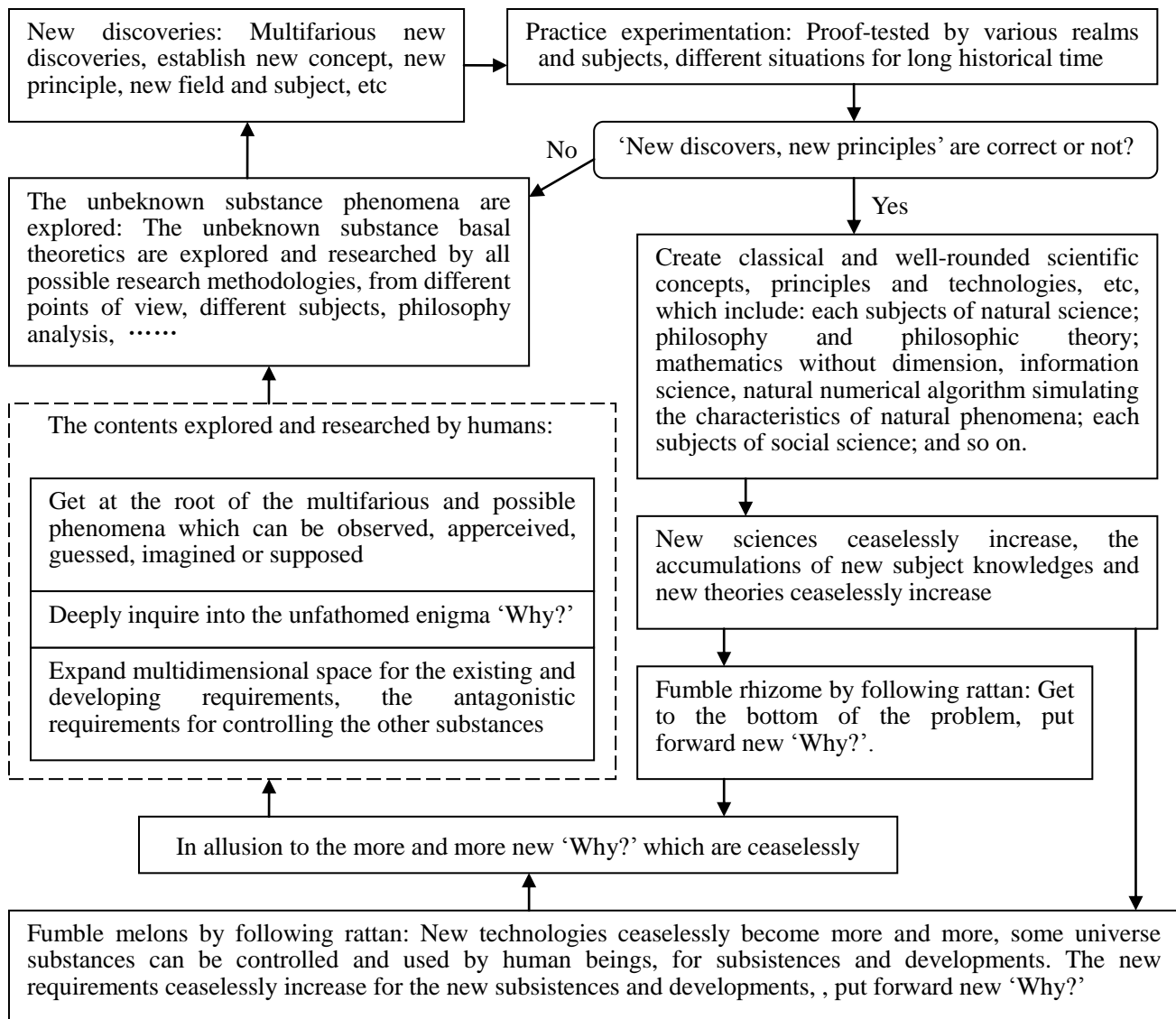


Fig. 4. The process of exploring universe substances by human beings at all times

3. THE PURPOSES, METHODOLOGIES AND ACHIEVEMENTS OF SCIENTIFIC RESEARCHES

3.1 Overall process of ceaselessly in-depth and patulous scientific researches by humans

The existent environment of the human ancestors and humans is the universal substance world which is incomparably anfractuouse, inexhaustible abstruse and

capriccioso, it is unboundedly large and rootless smallness. The scientific explorations and researches on the universal substances by human ancestor and humans ceaselessly deepen, more systematize, ... From the view of the situations which include the civilized development history of humans, the evolvment and challenges which are faced in all current subjects of sciences and technologies, human



cognitions about universal substances and their running processes ceaselessly deepen and expand. All scientific explorations and researches focus on some phenomena which can be observed, some problems which can be imagined or guessed, and so on. The contents explored and researched are shown in Figure 4, which focus on the factors and essential principles which create these phenomena; Then, universal principles are found, the new discoveries and new theories endlessly emerge; And these new discoveries and theories are adequately checked up by multifarious experiments and practices for long, these new scientific achievements are applied in own subsistences and developments; Based on the established sciences and

technologies as well as the requirements for farther developing, new unsolved brainteasers ceaselessly come forth, new exploratory researches ceaselessly are carried through. New discoveries, new concepts, new principles, new subjects and new technologies are continually established. New 'Why?' ceaselessly come forth, ... The process for humans to explore and research on universal substances and their running is as follows: explorations are ceaselessly increasing, there are more new classical theories, the capabilities are more stronger to control universal substances, and then new 'Why?'s are much more increasing. This process of ceaseless increases is shown in Figure 3.

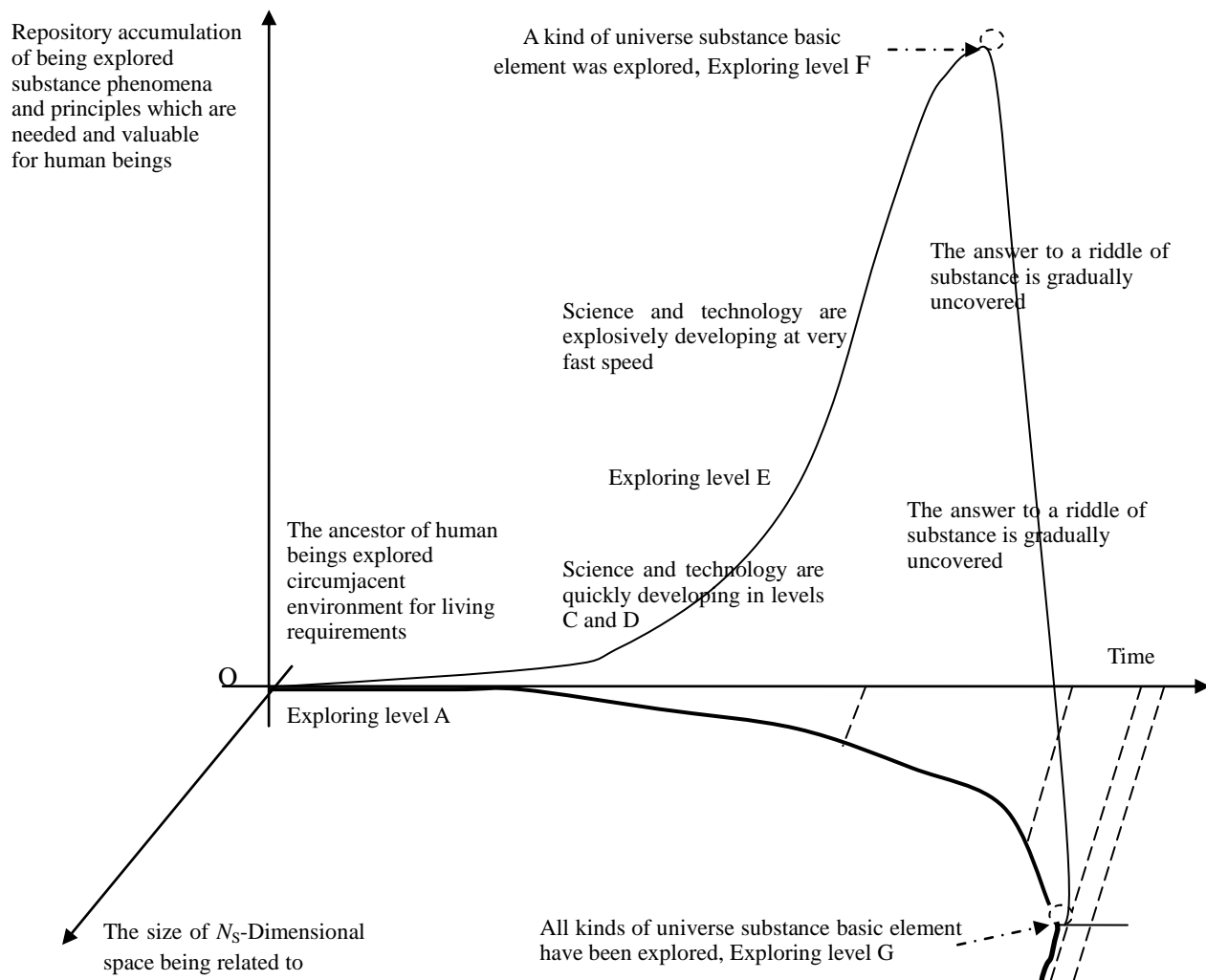


Fig. 5. The process of human beings exploring universe substance: The relationship between the  $N_S$ -Dimensional living space and the repository accumulation of being explored substance phenomena and principles which are needed and valuable for human beings

From no humans to human existing, and from human existing to nowadays, the overall process of ceaselessly in-depth and patulous exploring universe substances by humans at all times is shown in Figure 4, which includes the methodologies for scientific explorations and researches on unknown rationales of substances. The purposes,

methodologies and achievements of scientific researches by humans ceaselessly develop along with the changes of multidimensional environments. The relationship between the  $N_S$ -Dimensional living space and the accumulated quantity of the knowledge base explored by humans is shown in Figure 5.

In Figure 4, regarding on the history and actuality of scientific exploration methodologies, which include the purpose selections of scientific explorations and researches, methodologies for scientific explorations and researches on unknown essential principles, as well as the achievements of scientific researches are detailedly summarized as follows:

### 3.2 The purpose selection of scientific researches

In human subconsciousness, the scientific research purposes are to beforehand obtain all information and its properties with the most highest accuracy and reliability, that is, absolutely know from A to Z about the essences, structures, characteristics, causalities and other laws of all universal substances and their motion in multidimensional space. Then humans can predominate the maximum multidimensional astrospace, and freely use all the universal substances in this astrospace. That is, the scientific achievements are practically used in the forevermore unrestricted existence and developments of humans.

There is a 'Why?' on everything in the world of multidimensional universal substances, so there are countless unknown phenomena and essential theories to be explored and researched. There are several guide lines for humans to select the scientific research purposes: ① There is prodigious value for the research purpose of the time and in future; ② The technical feasibility of research project is prodigious, because the scientific exploration purpose cannot come true if technical requirements for this research consumedly overstep the stored scientific foundation of the day; ③ Humans can endure all kinds of huge expenses, and so on.

From human ancestor to humans, the scientific exploration purposes start from the jerkwater subsistence multidimensional space environment, and then continuously develop and broaden. The multidimensional space is the time –the occupied 3-D geometrical space- the occupied ... space ... for the persistence of existent life, which concretely incarnated as the necessary living environment, including: search after dietetic food, safe habitation, all kinds of biologies correlated with the explorers, the environment characteristics of geographical and climatic, and so on. The obtained multifarious and exhaustless new discoveries are uninterrupted used to improve viability and existent skills for explorers selves, the technical foundations are also synchronously improved for unceasingly exploring unknown substance world.

Since historical newsreel about human scientific researches<sup>[6]</sup>, from stone implements to spacecraft, the science explorations come through primitive, ancients, modern and present-day periods. The multidimensional astrospace are larger and larger for the selections of scientific research purposes; The cumulated rationale knowledge base which is required and valuable for humans, is also larger and larger .

Modern times is the period when sciences and technologies are developing at high speed, the selections of future scientific research purposes for modern humans start from the Earth which is our human cunabula, bit by bit, occupying and controlling multidimensional astrospace,

which is represented as the hundreds of future scientific research purposes to this day. For examples, 125 highlighted questions were published in 《Science》<sup>[7]</sup>, such as: What Is the universe made of? ... , and so on.

### 3.3 Methodologies for scientific explorations and researches on unknown essential principles of substances

Based on the history of scientific explorations and researches, it is obvious that: To reach the selected purpose of scientific exploration for existing and grandly developing under the substance conditions of the day, usually human ancestors and our humans concretely analyze the unknown idiographic phenomena by playing hard and using all possible methods to obtain the new discovers. The optimized methodologies of scientific explorations redound to carry out the selected scientific exploration purpose if the technical requirements for this purpose don't overstep the stored scientific foundation and multidimensional space environment of the day; Contrarily, if the methodologies of explorations and researches are not correctly selected, the methodologies make against carrying out the exploration purpose. However, the exploration methodology which is initially considered as the optimal and most reliable is not always successful; moreover the exploration methodology which is initially considered as the unscientific and unauthentic scheme is still potentially successful crowner.

By summarizing the history of scientific explorations and researches, there are multitudinous methodologies of explorations and researches, each of these methodologies also mutually associate and alternate. Researchers synthetically apply many methodologies, but some methodologies have to be used in all scientific researches. These methodologies of scientific explorations and researches are basically summarized as follows<sup>[2,3,8-11]</sup>:

- (1) The methods of informatics and systematization: ① Investigate and study on multifarious correlative scientific information, as well as collect and summarize the literatures and datum<sup>[12]</sup>. The detailed evolutions of multitudinous research areas and subjects in all kinds of sciences, such as sciences on physics<sup>[13-15]</sup>, chemistry<sup>[16]</sup>, information<sup>[17-21]</sup>, technologies<sup>[22-25]</sup>, and all research areas<sup>[12]</sup>, are ceaselessly and respectively investigated and summarized. ② Systematically and across-the-board attempting all possible research methods by inexhaustible explorations, which includes: converse proceeding, or wrong research, or made a foolish figures by laypeoples, or overmany groping impolicies, or the results obtained by some devastating factors and so on. Ref.[1,22,26] respectively considered all possible search regions. ③ Systematism, cybernetics, antitheses and comparison, and all kinds of information theories. Ref.[1,23,25,27-29] applied cybernetics based on large information systems. ④ The whole scientific knowledge base is divided into many subjects by multifarious criterions, and every ramosed subject is detailedly divided into more smaller subjects. ⑤ The methodologies of dissipative structuralism and coordination, which combines and systemizes the different subjects, and includes all subjects in natural science, social science and engineering

- technology. All papers respectively acquiesced the concept of different subjects, as well as synthetically and systematically applied several kinds of subjects.
- (2) Mathematics, the strongly indispensable basic tools for scientific explorations and researches: ① The symbolic logic models and simulation mathematic methods based on suppositional or idealized conditions. Ref.[26] predicted based on mathematic model, Ref.[15,24,25, 30-34, etc] are all based on complicated models. ② Mathematicization and numeralization, large-scale numerical simulation. Ref.[1, 24, 25, 32-38, etc] did a mass of numerical simulations. ③ The methods of data processing<sup>[38]</sup>, operational research and optimization, decision-making<sup>[24,25,32-34]</sup>, battle simulation<sup>[1, 25, 29, 33]</sup>, economicism and social science<sup>[39]</sup>, etc.
- (3) Logic methods: ① Transition, scientific abstraction and visual reification, which are in allusion to the invisible and imperceptible objects, as well as the problems which are not directly observed and cognitive. Ref.[1,35,40,41, etc] abstractively think about problems. ② Logic ratiocination and attestation method: philosophical method based on natural science researches, philosophic theory and its reification in the scientific explorations and researches. Ref.[42-44, etc] respectively applied logical consequence and concretely philosophic methods. ③ Induction and deductive method, analytical method, relevancy and syntheticism: human thinking structures continuously evolve along with the process of exploring universe substances, this evolutionary process deal with the unknown phenomena and data which are obtained by observations and experiments. Ref. [30,41,45-47, etc] used this kind of logical thoughts. ④ Analogism, contrast, taxonomy and systematism generalization; A new analogous theory can be obtained by homoplastically deducing based on the classical theories in different subjects. Ref.[48,49, etc] applied analogism, Ref.[23,29, etc] applied intellectualized analogism. ⑤ Elenchus: Self-questioning, criticism and estimation, puzzleheaded and controvertible imagination, expression communion and disproof, test by the applications in all kinds of correlative scopes. Ref.[18,50, etc] carried through logical self-questioning. ⑥ The other logic methods, such as: Boolean search, Boolean calculation, logistic rank, logical positivism, and so on. Ref.[18,22,26,41-44,48,49, etc] applied this kind of logical thoughts.
- (4) The forethought imaginations are proved: ① Firstly scientific suppositions and then proved and checked up: new suppositions (such as new concepts, new principles, new theories, etc) as well as the methodologies of forecast and converse thinking are imaged, these suppositions are not restricted, and can disobey or be conflictive with the modern classical theories. Ref.[51] proved that a former theory is correct. ② Inverse design method  $\equiv$  suppositions + proved by all kinds of technological means, that is, continuously repeat 'suppositions which include new concepts, new principles, new theories, and the basic parameters  $\rightarrow$  checkout  $\rightarrow$  suppositions  $\rightarrow$  checkout  $\rightarrow$  ...', until satisfy or negate the suppositions, or exit circulatory iterative design because the other iterative condition is negated<sup>[27,52,53]</sup>.
- (5) The methods based on opportunity and inspiration: ① The new discovers and innovations are obtained by opportunity, inspiration and fanciful thinking in the process of scientific explorations and researches based on the principle of materialistic dialectics<sup>[9]</sup>. Ref.[54] created a new discovery from an old movie. ② Quantitative change or saltationist methodologies, brainstorm method and the inspirations are wakened up by chrorical and comprehensive discussions as well as debates. Ref.[55,56] argumentatively discussed scientific researches.
- (6) The methods of real and multidimensional experimentations based on the sensate substances and phenomena: ① Being personally on the scene for experiences, observations and examinations, long-term and multidimensional experimentations with high precision and authenticity<sup>[57]</sup>. ② The achievements of scientific researches are are chronically checked up, based on the extensive classical theories in all kinds of subjects. The checkout criterion is that the achievement should be reconcilable with all classical theories, also checked up by digital- practicality-logicality; The new achievements are widely used in engineering practices. Ref.[ 57-61] did researches based on the sensate and measurable substances.
- (7) Other scientific exploration and research methodologies: these methods not presented above, but they are used by humans and no recordation or report. Because most of summarists on methodologies of scientific explorations and researches are not the researchers who work on detailed scientific projects.
- It incidentally indicates that each of the references in this paper respectively applied the their research methodologies, which are the obvious examples; Actually every reference synthetically applied multiplicate scientific research methodologies; Simultaneously, each of all technological documents (such as all published papers) and scientific projects synthetically and intangibly apply several kinds of the research methodologies.

### 3.4 The history and actuality of scientific achievements

From no humans to human ancestors, and up to modern humans, during microorganism period, ancestors understood few universe substances and their motion characteristics; After long-term evolution and up to the present day, human ancestors and humans accumulated extremely enormous scientific achievements, which include at least the follows<sup>[2, 10]</sup>:

During the period of remote antiquity: the explorations and applications of inartificial block and timbers, forging stone implements, using fire and burning, halieutics and shikar, the elastomer explorations and the invention of bow arrow, agriculture and stockbreeding, crockery and bronze ware, the development of multifarious technologies and productions, the change of social organization, pictures, languages and words, original religions and churches, and so

on.

Neoteric sciences: Understanding the motions of celestial bodies and objects on the Earth surface, exploring life arcanum, research on element and substance transformation, calorimetry and discovering thermodynamics law, research on electromagnetism, seeing about light phenomena, technical development in industrial era, and so on.

Modern sciences: the quantity of scientific achievements explosively increases as well as the profundity and difficulty rapidly advance, for examples: physics revolution, element changeability and new chemistry theory, astronomy of searching for universe boundaries, prospecting for evolution and structure of the Earth, heckling the life hypostasis, the essentiality and top of modern numeral, all-around science, exploring complexity by nonlinear science, the development of applied science and technology, the breakthroughs of modern dominant techniques are developed as a great deal engineering technologies, such as: communication, biology, aerospace, material, energy sources, manufacture and so on. These modern sciences upgrade viability and expansibility, and so on. From Ref.[2-6,12-25,58,62,63, etc], it is obvious that every small research area created a lot of research methods and the corresponding achievements.

#### 4. THE CHARACTERISTIC ANALYSIS OF SCIENTIFIC EXPLORATIONS AND RESEARCHES BY HUMANS

There are a lot of strongpoints and shortcomings in the scientific explorations and researches by humans. The shortcomings are basically presented as: By using the exploring methodologies with human features, humans just explore and research on the external phenomena of substances; The obtained achievements are valid under the definite conditions of multidimensional environments, and there are more and more unfathomed enigmas because the achievements ceaselessly increase. These strongpoints and shortcomings are embodied as follows:

##### 4.1 The properties of selecting scientific research purposes

###### 4.1.1 The strongpoints of selecting scientific research purposes

In the multidimensional environment of subsistence and development, the optimal research purposes are systematically selected based on the prescient future requirements, which can satisfy all kinds of possible demands of humans. Many factors of the research projects are across-the-board, systematically and synthetically considered, such as importances, the technological feasibility, as well as the endurable capability of economic and physical environments in the world, etc. The selected research purposes are ceaselessly in-depth and patulous, as well as their difficulty indexes increase<sup>[2-7,12-14,17,62,63]</sup>, which mainly indicates that the involved multidimensional space becomes larger and larger, synchronously more and more microminiaturization; The efficiency, feasibility, reliability and controllable for accomplishing the selected research

project are continually improved, the ratio between the cost and worthiness of the research project continuously decreases, and so on. Ref. [16,29,60, etc] continuously did in-depth researches, Ref.[61] can reliably finish the research about the new measurable phenomena.

###### 4.1.2 The shortcomings in scientific research purpose:

###### The external phenomena of universal substances are explored and researched by humans

The shortcomings in scientific exploration and research are as following: To implement primary objective, at all times human ancestors and humans everlastingly explore and research on 'the external phenomena of universal substances and their running'; The unknown phenomena is just explored and researched on, if the phenomena can be apperceived, or measured or envisioned by all possible means and equipments of sciences and technologies.

The pursued primary objective of scientific explorations and researches by humans is to occupy and control the maximum  $N_5$ -dimensional astrospace, and all substances in the whole multidimensional astrospace. Therefore, humans continuously deepen and more systematize the area 'causalities of inexhaustible phenomena which created by multidimensional motion processes of universal substances'.

Humans ceaselessly and systematically improve the explored achievements, because these achievements (namely scientific laws) were proved to be undound or so much as disconfirmed by later generations when these scientific laws are further lucubrated and generalized for improving multifarious technical indexes, although these scientific laws were chronically and widely proof-test by practices times without number as well as then were assured by everybody.

The multidimensional motion processes of universal substances create the inexhaustible, capriccioso, incomparably abstruse phenomena in multidimensional astrospace. These exhaustless phenomena create the inexhaustible 'mathematics- physics -logic relationships' which are composed of anterior phenomena and latter phenomena. The processes regarding on the transformation of these databases along with multidimensional space are shown in Figure 3, where,  $\odot$  is the units of foremost substance basic elements;  $\circ$  is the result of anterior conditions, and the condition of latter results. These conditions and results are the external phenomena which are created by the multidimensional motion processes of universal substances, these substances include all levels and all kinds of universal combined substances and SBE units, each substance  $\circ$  is shown in Figure 3. The explorations started from the most essential existent requirements of human ancestors, that is, started from the explored point A  $\rightarrow$  reached exploration level B, because of ceaselessly in-depth explorations and evolution accumulation  $\rightarrow$  exploration level C: ceaselessly in-depth explorations and evolution accumulation  $\rightarrow$  exploration level D: ceaselessly in-depth explorations and evolution accumulation  $\rightarrow$  exploration level E: ceaselessly in-depth



explorations and evolvement accumulation  $\rightarrow \dots \rightarrow$  exploration level F: a part of the foremost SBE units have been touched and discovered  $\rightarrow \dots \rightarrow$  exploration level G: finally discover all of the foremost SBE units. Before the exploration level F, the explored scope is larger and larger, and the knowledge base becomes more and more; After the exploration level F, the explored scope is smaller and smaller.

In Figures 3 and 5, the scientific exploration level of nowadays humans is probably at the level between D and E, which is in quickly developing phases. If humans are going to continually apply the traditional scientific exploration methodology "inexhaustibly explore 'the external phenomena created by the motions of universal substances'" at all times, humans have to pass through a very faraway road to implement the human primary objective of scientific explorations and researches.

On the other hand, in the process of selecting a scientific research purpose, everyone usually analyzes how much advantages and shortcomings from this research to himself? If this scientific research can create benefits for himself, he agrees upon this research; Otherwise, he disagrees upon this research.

## 4.2 The properties of scientific exploration and research methodologies

### 4.2.1 The strongpoints of scientific exploration and research methodologies

The strongpoints of scientific exploration and research methodologies are as follows:

- (1) The unconstrained purposes and methodologies of scientific explorations and researches are maximated considering the values and feasibility. Under the conditions of the living environments and cumulated rationale knowledge base, humans across-the-board and systematically search out some exploration purposes<sup>[2-5]</sup>. To obtain the new discovers by exploring the unknown substance phenomena for these exploration purposes, humans concretely analyze the idiographic problems, and apply all possible imaginable and applicable methods by fair means or foul.
- (2) The new methodologies of scientific explorations and researches continually appear<sup>[11]</sup> therefor, new breakthrough discovers are ceaselessly explored, moreover, innovations continually come forth in engineering technologies. Ref.[ 1,3,26,28-31,33,40,42-44, 47,51, 54,57,59, 64-69, etc] obviously and respectively applied different new research methodologies.
- (3) The methods of scientific explorations and researches possess the combination between altitudinal abstraction and reification, altitudinal accuracy and veracious fuzzability, rigorous logicity, sufficient dialectics, reliably doubtless inevitability and randomness, universal catholicness and cabined specialization, stability and saltationist. In Ref. [25,36,37,42-44, etc], the abstraction integrated with the detailed problems, and there are rigorous logicities in all references.
- (4) Guess and imagination become theory, the theory is

continuously and gradually perfected by all kinds of technologies, keeps improving and finally becomes classical theory<sup>[2-6]</sup>.

- (5) Failures are success' mother, persevere and insistently follow up<sup>[9]</sup>; Ref.[21, 37, etc] insistently followed up the researches on long life for humans at all times, Ref.[22] insistently fight against adversaries at all times for the information security.
- (6) Theories ceaselessly evolve and extend, as well as are applied in practice, such as Ref.[ 1,57,58,65-67,etc].
- (7) The research achievements are chronically and continually checked up by all kinds of subjects, and these achievements are possibly inspected to be extensive validity, on the other hand, these achievements are also potentially corrected and keep being improved<sup>[2-6,12-25, 62,63]</sup>.
- (8) Holism and unification of scientific explorations and researches, the colonies of numerous subjects cooperate with each other, the methodology of each subject (such as natural science, social science and engineering technology) continuously go unification<sup>[12, 62]</sup>. In Ref.[1, 39,45,46,64, etc], there are all-pervading adaptability and universality as well as narrow sense specialization; There are synergic properties of multitudinous subjects in every reference.
- (9) The efficiency and reliability of scientific exploration methods are all continuously increased, the expense for explorations and researches increases, comparing with the total production values of humans of the day<sup>[2-6]</sup>.
- (10) The relationship between humans and nature ceaselessly changes, the nature conception of humans continually, scientifically and constitutionally change; scientific explorations and researches are socialized. There is socialization of scientific researches in Ref.[ 16,18,22, 25, 39,55,56,etc].
- (11) Ceaselessly search and put forward the future scientific problems, new 'Why?'s continually come forth<sup>[6, 4-6]</sup>. Ref.[7,12-14,16,17,61-63,65, etc] respectively indicated the new problems to be researched.
- (12) To explore and research based on all possible intelligences of all humans. The scientific researches are inexhaustibly explored in the whole multidimensional space of global universe scope, and don't give up every imagination which is vagarious, hopeless, noneffective, and making a foolish figure. Ref.[54] created a new discovery from a movie. Because some scientific breakthroughs may be obtained if scientific explorations and researches start from these imaginations. Humans adequately apply spacious 'layman' from of old to solve all kinds of scientific research problems. Although the characteristics of achieving the research objectives by the 'layman' are lower efficiencies, most 'layman' obtained noneffective results in multidimensional environments, but few or none 'layman' obtained super top-quality results; At the same time, some of the useless 'layman' scenarios in modern times, may be the optimal schemes in future. The extensive 'layman' are onlookers and one or two of them see most clearly; which avoids the experts deceptively dig into a pyramid. For examples, there are



many fantasies which are handed down from our ancestors, 'clairvoyance', 'clairaudient', 'speed across the sky', 'a step is a great distance', 'long live and ageless', 'creating somethings out of thin air', etc. Currently some fantasies have been come true: 'clairvoyance' means wireless field pickup, 'clairaudient' means mobile cell phone, 'speed across the sky' means aeronautical vehicles, 'a step is a great distance' means astronomical vehicles, and so on.

#### **4.2.2 The shortcomings in scientific research methodologies: There are factitious factors in scientific researches, that is, exploring methodologies with human features**

##### **4.2.2.1 Humans give center to selves, and think that all substances except humans and other animals don't have 'sentience' and 'ideation'**

From General principle IV, it can be known that all levels and all kinds of universal substances respectively apply their peculiar 'sense' systems to observe the circumjacent environments, find out surrounding information and respectively 'think' about the strategies to obtain the maximum  $N_S$ -D space, in their multi-Dimensional existent environments.

In fact, humans and all kinds of animals are a sort of substance existent forms, and this sort of substances has 'sensorial' and 'observational' systems, as well as 'awfully intellectual ideation'. The same kind of substances can easily communicate with each other by multifarious modes. The different kinds of substances are different to communicate with each other; they can respectively perceive some multi-Dimensional phenomenological information and then make with reactions, after they directly come into contact with each other in the running process. Currently, if all levels and all kinds of universal substances are deemed to have sensorial capabilities and ideation, then humans think that 'all kinds of substances (such as plants and abiological bodies) are humanized'.

Because all levels and all kinds of universal substances adequately apply their 'sensorial' and 'observational' systems in the multidimensional space, and respectively apply their 'awfully intellectual ideation', the universal world is inexhaustibly complex, unfailingly ingenious and artful, inexhaustibly mysterious, inexhaustibly ...

Currently, the sum of nonhuman 'high intelligent ideation' is consumedly superior to the high intelligent ideation of humans. This can be mainly incarnated by the comparisons between nonhuman 'extremely ingenious' designs and the masterly designs by humans:

Nonhuman 'extremely ingenious' designs: These designs are created by the antagonistic motions among all levels and all kinds of universal substances in  $N_S$ -dimensional voluminousness and rootless smallness astrospace. These ingenious phenomena include boundless abstrusity and any grotesque circs, extreme carefulness, multidimensional and all-around systems, inconceivability and inscrutability for humans, ...; It is noteworthy that the phenomena created by human masterly designs are also adequately applied.

The optimal and masterly designs by humans: These designs are created by imitating, direct copying, guessing, and all possible applying the results and processes of nonhuman designs, and so on.

It is noteworthy that the purpose of human designs is to despoil the maximum multidimensional space, human masterly designs have to most appropriately collaborate with nonhuman substances, otherwise, the purpose of human designs can not be reached. Therefore, humans firstly explore the substances' structures and the laws about the  $N_S$ -D motion phenomena, then humans apply these laws to maximize the  $N_S$ -D space for humans by borrowing some substances, that is human designs. However, all levels and all kinds of universal substances have respectively and optimally designed their mutually cooperative and motion laws under all possible environmental conditions, humans have to comply all laws of the substances. Because the  $N_S$ -D astrospace which is occupied and controlled by humans is consumedly smaller than the one which is occupied and controlled by other substances except humans, currently unhuman design ability is extremely better than the one of humans. Currently human design can just roughly and partially imitate the running phenomena of some substances, such as 'bionics' technology, aerospace technology, and so on.

All levels and all kinds of universal substances are 'thinking about' something, the same kind of substance can easily communicate with each others for rapping off, for examples, humans can communicate with each others, all congeneric animals can communicate with each others; the congeneric substances think that their brainpower is not bad, and there is soul for themselves; If two categories of substances are more closer, the two kinds of substances can more easily communicate with each others; By contraries, if two categories of substances are more far away, the two kinds of substances can be more difficulty to communicate with each others.

##### **4.2.2.2 Humans just considered the following factors: all factors which can be apperceived, measured and envisioned by all possible means and equipments of sciences and technologies; Catch hold of primary, lesser and potty factors; Ignore the absolutely neglectable and wondrously jerkwater factors, as well as the one which cannot be suppositional, perceptive and measurable by all possible technological means and equipments**

The  $N_S$ -D motion  $\vec{M}_{\text{Universal}}$  of universal substances [which is presented in Eq.(2)] is 'all-inclusive' complication, which across-the-board and systematically includes all possible factors. Because any universal substance is absolutely in the environment where there are multitudinous levels and multitudinous kinds of universal substances in multidimensional space, the all possible interplays among these large numbers of substances have to be considered. That is, it is necessary to consider the primary, lesser and potty factors, synchronously, it is also necessary to consider these factors which are absolutely neglectable and wondrously jerkwater. It potentially connotates some problems, if the researchers just consider the factors which

are primary, lesser and potty, at the same time, they can be apperceived, measured or envisioned by all possible means and equipments of sciences and technologies, however, ignore these factors which are absolutely neglectable and wondrously jerkwater. It is noteworthy that the absolutely neglectable and wondrously jerkwater factor is proved by theoretical explorations of various subjects in multidimensional space, and then practicably and widely checked up by all kinds of fields in various subjects again and again, the checkout results are shown that the efficiency acted on a system by this factor assuredly close to zero, there is completely no physics-mathematics- logics significance. However, regarding on the decisive effects on that system by this factor which can absolutely be ignored, there are at two existent forms of the effects: ①The factor can efficaciously act on the system along with the change of substance environment in multidimensional space, which is going to be uncannily discovered by the in-depth explorations and researches in numerous subjects; ②After the system passes for a long time, the effects created by these absolutely neglectable factors have accumulated and become qualitative change. After this qualitative change is found, the system has to pay huge cost to recuperate itself, or it can not be recuperated.

The observed scopes are ceaseless micro-miniaturization; Synchronously, they are ceaseless more and more tremendous. The cut-and-try and observational accuracies in all kinds of subjects are ceaseless improved; The considered factors ceaselessly increase, which include diversified, 'negligible' and randomness disturbances.

The performances of applied equipments are ceaseless upgrade; Each apparatus functions of humans, such as brain, are all ceaseless assisted by various advanced equipments and instruments, therefore, human capabilities, such as memory and storage, the real-time celerity and veracity for reflections, super high-speed and jillion computation capability, and so on, are all ceaseless swelled.

#### **4.2.2.3 The whole knowledge is divided into multitudinous subjects, then a great deal of different offshoot subjects and synthetical subjects.**

Under the diverse conditions in different periods, almost all of scientific and technological researchers generally have 'first impressions are strongest' mental prejudice, there are some human subjective consciousnesses in the cognitions about exploring universe substances<sup>[10]</sup>. Firstly, humans start from objectivity existences which can be imagined, cognitive and measured by multifarious means and advanced equipments of sciences and technologies, ceaselessly explore the unknown phenomena of universe substances and their motion, find out new characteristics of motion phenomena, and then conclude and summarize these new causalities of process as 'objectivity laws', therefore, there inevitably are some factitious factors in the achievements of natural sciences. The factitious factors in natural science knowledges don't negate the objectivity in nature world, because the objectivity in nature world is the summing-up under some conditions, although the other conditions are still not considered, these thoughtless

conditions are the same as the one when the 'objectivity laws' are chronically and widely checked up<sup>[11]</sup>. Therefore, humans classify the 'objectivity laws' which are summarized under the multidimensional conditions, and set up multiform criterion for compartmentalizing sciences, the different partition criterion compartmentalizes different kinds of large object groups, and then each large object group is divide into different smaller object groups, ·····, then divided into research fields, finally divided into detailed research problems and so on.

It is noteworthy that humans are a sort of universe substances, all kinds of scientific activities 'exploring universe substances based on the most advanced high tech', 'artificial intelligence' and so on, are just some running forms of universe substances; In the social science, all kinds of human activities in the world, such as the cooperations and rivalships (or tussles) among humans which are controlled by 'high brainpower' and 'soul and spirit', are also just some running forms of universe substances; In engineering technologies, all kinds of researches and exploitations for engineering productions based on 'the up-to-the-minute achievements of natural science explorations' and 'expert repository system', are also just some running forms of universe substances. 'Humanities and social science' just focuses on the multidimensional motions among the same kind of substances, its main character is that all multidimensional conditions of these congener substances are respectively same; Under the same conditions, congener substances undergo inexhaustible, unrestricted, multidimensional antagonizing and cooperative motions.

To solve all kinds of scientific research problems, humans roundly apply enigmatic experts on the detailed subjects or the vicinal subjects to efficaciously obtain the top-quality results which are the global and optimal results under the conditions of the living environments and cumulated rationale knowledge base; However, the shortcoming is that these 'global and optimal results' are actually the locally optimal and provisionally efficacious results in the multidimensional space of whole universe.

In conclusion, the above object partitions are absolutely doing research on the causalities of the external phenomena of some universal substances and their multidimensional running processes; 'Literae humaniores and social science' just does research on the running processes of researchers selves which are the same kind of substance. Therefore, the explorations and researches of humans, not only include disaffinity species substances, but also include the same kind of substances which cooperate and(or) confront with each others, also include multidimensional physical phenomena which are created by many kinds of motions from multitudinous substance combinations controlled by humans and other substances, and so on.

### **4.3 The properties of scientific research achievements**

#### **4.3.1 The strongpoints of scientific research achievements**

The strongpoints of scientific research achievements

are as follows:

- (1) Firstly, the scientific research achievements of human's ancestors and humans are usable for humans' ancestor and humans to continuously exist, continuously evolve and develop up to the present; In this existent and evolving process, these innumerable scientific achievements let human's ancestors and humans stand against exhaustless life-and-death tribulations.
- (2) The scientific research achievements all along and ceaselessly penetrate with fargoing multidimensional astrospace and iota structure, and these achievements all along and ceaselessly increase, as well as their deepness and difficulties are augmented. Ref.[71] did researches on atom models, Ref.[34] did research on optimal flight in solar system.
- (3) Based on imaginary or ideal models, experimental organon and so on, the main inconsistencies are protruded to be transacted; Catch hold of primary, lesser and potty factors, ignore these absolutely neglectable and wondrously jerkwater factors (including the weenie stochastic errors in experiments), as well as the one which cannot be suppositional, perceptive and measurable by all possible technological means and equipments. Ref.[15,31, 37, etc] upbuilt models considering weenie and stochastic facts, Ref.[20,21,58-61, etc] did researches based on the measurable physical phenomena.
- (4) Can be described by mathematics. The physical logic laws which are obeyed by basic concepts, can be described by exact mathematical expressions and formulae. Ref. [15,24-26,30-34, 37] respectively did researches based on mathematical expressions and models.
- (5) Simplification, more higher precision, veracity and credibility. That is, the form is laconic, it can be acoup sur for being simply and expediently applied in practice; All substance world of the whole universe is simulated by super large-scale cloud numerical computations<sup>[1, 35]</sup>.
- (6) Be provided with forecast capability, that is, forecast the physical phenomena which are known before. Ref.[26] can obtain a previously elusive prediction objective because of considering both pairwise and many-body intermolecular interactions in water, Ref.[20, 21] can predict parameters and diagnose the states by inquiring deeply into the structures.
- (7) Can be justified themselves. There is no self-contradictory situation in the same subject; There is also no self-contradictory situation about the concepts and theories in the numerous subjects, all subjects are across-the-board and systematically harmonious and coincident. In Ref.[68], a theory and other principle are justified to systematically be harmonious and coincident.
- (8) Unification trend increases<sup>[11, 70, 71]</sup>: The minimum amount of the basic concepts and elementary principles are applied to open out the hypostases of physical phenomena, which includes the unification of scientific laws, that is, the statuses of all substances not only can be described by a same method, but also unpuzzled by a same theory; unification of scientific languages,

unification of scientific ways and means, unification of scientific purposes, unification of natural science and social science. Ref. [1, 45, 64] etc respectively established the general method and technique.

- (9) The existing basic theories are endlessly developing for more higher accuracy and larger extensity, and are chronically compatible with the experimental results from all kinds of subjects. Ref. [40] got new discoveries by redefining basic systems. Ref. [60] upgraded and improved the former achievement.
- (10) All scientific research achievements are continuously transformed into engineering products and so on, for multifarious requirements of humans. Ref.[18,58,65,66 etc] showed that the new requirements are applied in engineering practices; synchronously, these requirements and transformation processes bring forward some new purposes which are unceasingly explored and researched<sup>[4, 5]</sup>.
- (11) Regarding on each of all scientific research achievements, there are some new problems which should be unceasingly and drastically explored and researched. Ref.[16] found new problems, Ref.[7,12-14,17,62,63,65, etc] respectively pointed out the unceasingly researched problems.
- (12) There may be some excellent scientific achievements, which were not passed down or not published, because these achievements could damage the interests of some people, or were not proof-tested in practice during their babyhood..

It incidentally indicates that there are a lot of strongpoints in the scientific methods and achievements of all research projects, the above presented examples about the references are just the obvious points.

#### **4.3.2 The shortcomings of the scientific achievements: These achievements are valid under the definite conditions of multidimensional environments, and there are more and more unfathomed enigmas because the achievements ceaselessly increase**

The knowledge quantity of scientific explorations, started from the tiny lore which are explored by human ancestors' ancestors' ... ancestors for their living substance environment on the Earth. After chronically, momentarily, diffusely and systematically went through explorations and researches, this tiny lore evolved into the huge knowledge base of modern humans. That is, regarding on exploring the unknown universe substances, human ancestors and humans have obtained huge amount of new breakthrough discoveries, and the huge amount of knowledge base have come into being, which is mainly presented as many modern subjects in knowledge base. Some problems in this huge knowledge base are as follows:

##### **4.3.2.1 This huge knowledge base is valid under the conditions of multidimensional environments where the built base is explored and researched, however, this huge knowledge base maybe be invalid if the multidimensional environments are contravened**

In the multidimensional space environments of

subsistence and development, human ancestors and humans went through 'inexhaustible' explorations, and obtained innumerable new discovery achievements, which run up to an immense knowledge base system, that is, the scientific laws in all kinds of science subjects. These scientific laws uncover the structures of substances and their running laws which humans want to explore, in the multidimensional space environments where humans existed and developed. The huge knowledge base is a set of the numerical algorithms which indirectly, approximatively and quickly simulate the phenomena regarding on the structures, functions and characteristics of universe substances and their motions. This huge knowledge base indicates that humans have carried out their scientific exploring purposes which they incipiently selected. There are some merits and demerits in this huge knowledge base.

The merits are as following: In the definite multidimensional space (that is, time, 3-D geometry physics space, ·····), in the definite partial scope (that is, some systemic states under the conditions of very hairlike and high precisions), this scientific object is correct, reliable, quickly calculated, and so on; as well as it is checked up and widely applied times without number in the definite multidimensional space (that is, long-term history, the extensive roomage which can be observed by humans).

The shortcomings in these scientific laws are as follows: In the extensive multidimensional space, the causalities of the basic principles cannot come into existence and these scientific subjects are noneffective, because the status conditions arbitrarily change and go beyond the applicable scopes of these basic principles. Currently there is no general principles and algorithm for all universal substances system in the whole universal multidimensional space, which can be reliably, practicably, far and wide applied. This is because humans explore unknown substance phenomena under the determinate conditions which basically is the unknown substances and their characteristics which can be imagined, cognitive and measured by multifarious means and equipments of sciences and technologies; The substance interactions of some levels and in the definite scopes are considered, but the interactions of the other levels or outside the definite scopes are not considered. It is distinct that the functionary characteristics from the more higher level substances are changeless at all times in this multidimensional space; and the influence characteristics from the more lower level substances should be observed by using the higher multidimensional precision, and so on.

The experiential formulae have been explored and summarized according to the phenomena which previously occurred in the complicated multidimensional circumstances, and then they were deemed to be accurate by chronical, continual, practical and wide checkout; However, the human sciences are still distempered, that is, humans are in the process of exploring and cognizing universe substances, there are 'inexhaustible' unfathomed enigmas; If some substance statuses appear but these statuses never occurred when the experiential formula were established and checked,

this experiential formula maybe be invalid and inaccurate. If the substance statuses and surroundings are numerically simulated, which are calculated by the universal numerical algorithm  $\vec{M}_{\text{Universal}}$  and directly based on the rock-bottom basic elements in the whole universe, the acoup sur potential is prodigiouss for calculation results of this substance in all possible  $N_5$ -D space. Ref.[69] indicated that future cannot be exactly predicted with high precisions; Another example<sup>[1]</sup>, it is usually correct for the total performances of a flight vehicle to be calculated by using an analytical formula which is numerically fitted based on the database of a flight vehicle performances, under the idealization conditions; However, the calculation errors are appeared if there are some stochastic disturbances, such as stochastic wind field, the errors of aerodynamic shape, etc. If the total performances are calculated by integrating 7-D motion differential equations based on CFD algorithm which is similar to universal numerical algorithm, the calculation errors of the total performances are cleared away.

#### **4.3.2.2 How large exploring scope and cumulated knowledge base humans can endure? Because the knowledge base is more larger, there are more and more unsolved brainteasers to be explored**

Humans explore the laws of all universal substances and their motion in multidimensional space by all possible technological methods, the explorations started from the most elementary living requirements, along with the unceasing and in-depth explorations as well as the researchful evolution accumulation, the explorational levels are continually exalted and the scopes are much more broadened; In the recent hundreds of years, a great deal of new discovery achievements continually and rapidly come forth, and were published in a mass of Journals; The explorational achievements are continuously accumulated and the knowledge base is ceaselessly augmented. Therefore, there are some problems:

The new 'Why?'s which are required to be explored and researched are going to ceaselessly increase. If the scientific knowledges are increasing, and the new 'Why?'s are also increasing; If the explored and controlled multidimensional astrospace is more larger, the new 'Why?'s and the requisite innovations become more and more. Actually, although humans are 'high intelligence' animals, humans are just a bit of substances inside weeny Milky Way galaxy in the multi-Dimensional world of universe substances. Can humans take on exploring all new 'Why?'s in the world of whole universe substances? How large the multi-Dimensional explored scope and the accumulative knowledge base can humans bear?

## **5. THE FUTURE OF HUMAN SCIENTIFIC RESEARCHES**

### **5.1 The purpose of future scientific researches**

The pursued objective (primary basic performance index) for scientific researches by humans is to implement the General principle II: Humans are going to occupy and control the maximum  $N_5$ -D astrospace (time, 3-D geometrical space, ·····), and all substances in the whole



astrospace run according to all sub-indexes which are pursued by humans. Humans can come true to freely use all substances in the whole universe. On the other hand, from the view of modern biology and medicine, all individuals of humans expect to be 'long live and ageless', which is just relative to the length of life-span and finally the individuals are going to die all the same.

Humans can occupy, control and use the whole multidimensional astrospace and all substances by paying much less costs. If humans can obtain more information regarding on the universe substances, such as across-the-board and systematically compositive ingredients, structures and motion characteristics, humans can control and use the universe substances by paying much less costs, with much less difficulty, more higher efficiency and reliability. If the most original fundus of  $N_S$ -D universe substances can be found out, and then by paying more jerkwater cost, humans can easily and freely control all substance in the whole  $N_S$ -D universe which is immense large and rootless smallness, by controlling the key and primary springheads in the further springhead of the further and further springhead of the further and further and further springhead of further<sup>N</sup> springhead ( $N>1$ , power N) ... further<sup>k</sup> springhead ( $k<N$ ), the control results are the highest efficiency, absolute reliability and abstrusely dulcet idiosyncrasies. These the key and primary springheads are the most original fundus of universe substances, that is, the SBEs and their properties, which are shown as sign '⊙' in Figure 3.

Not only the varieties of physical quantity are nonlinear, but also the concepts of science and technology are nonlinear. That is, the modalities of scientific development are going to be presented as the following phenomena, such as 'topic is displaced', 'concept is slinkingly replaced', 'the answer is not for the question' and so on. For example, there will be some new concepts for the astronautical transportation system in future, however, the principle of modern rocket engine is going to be invalid. For instance, more than 100 years ago (such as before the year 1900), 10000 books were supposed to be transferred from USA to China. Therefore, the trucks and ships could be used to transport those books, and it would take many weeks for the books to reach China by laborious land transportation-ocean shipping-land transportation if the weather and journey are just fine, otherwise, it would take more time. However, at the present time, it just takes several seconds for the electronic edition of the 1000 books to be transferred by electronic network system from a remote village in USA to a village in China. This electronic internet transportation is more better than the modern intercontinental transportation systems to transfer these 10000 books, such as 'land transportation-ocean shipping-land transportation', intercontinental aeroplane, rocket and space shuttle, because the electronic internet transportation provides with much more quick transportation speed, more safer and more lower-cost.

## 5.2 The methodology of future scientific researches

There are two ways for humans to find out the most

original fundus of universe substances, the SBEs and their properties: ① To forever and more ceaseless explore and research for obtaining new inexhaustible discoveries considering observability phenomena and unsolved brainteasers, ② Global integrative inverse design of universe substance.

(1) The traditional scheme 'forevermore endless exploration → inexhaustible new discoveries are obtained'

To endlessly explore and obtain inexhaustible new momentous breakthrough discoveries, is the traditional scheme which is applied since human ancestors up to the present, and this scheme is shown in Figure 4: Large numbers of unfathomed enigmas 'Why?' are explored and researched on → new discoveries are obtained; new concepts, new principles, new fields and subjects, new ... .., etc are established; the further and more new 'Why?'s are put forward for the existent and developmental requirements → Continuously explore and research on the increasing unfathomed enigma 'Why?'s → new discoveries are obtained; new concepts, new principles, new fields and subjects, new ... .., etc are established; the further and more new 'Why?'s are put forward → on and on ... .. → ... .. Finally, the explorations and researches reach the universe substance basic elements '⊙', which is shown in Figure 3.

In the traditional scheme 'forevermore endless exploration', the relationship between the  $N_S$ -D space of existence-development and the accumulated quantity of the required and valuable substance phenomena as well as basic principle knowledge base explored by humans, is shown in Figure 5. In the exploratory process, before the situation of a SBE is explored, the accumulated quantity of the knowledge base continuously increases, and the controllable  $N_S$ -D space of existence-development also continuously increases; After the situation of a SBE is explored, the accumulated quantity of the knowledge base continuously decreases, but the controllable  $N_S$ -D space of existence-development still continuously increases; After the situation of all SBEs are explored, the accumulated quantity of the knowledge base is a very small constant, but the controllable  $N_S$ -D space of existence-development continuously and allegro increases.

On the other hand, based on all possible intelligences of all humans (such as the foolish figure made by an imagination of 'layman'), the unity of science is also a form of 'forevermore endless exploration'. Based on the traditional scheme 'forevermore endless exploration → inexhaustible new discoveries are obtained', the unity of science is hunt about for, so that humans can simply, exactly, reliably understand all laws which are implicated inside inexhaustible and abstruse phenomena produced by universe substances and their opposed motions.

(2) Global integrative inverse design of universe substance

The inverse design method of universe substance is shown in Figure 6. The SBEs and the their inner parameters, motion equations and the other properties can be directly explored, by using a great deal of cloud and parallel numerical calculation, based on the universe substance basic



elements, the general numerical algorithm of substance running process and the general essential principles of substance running process, as well as the tremendous knowledge base which are presented as the form of

scientific principles. Finally, the substance phenomena which cannot be imagined or guessed by humans are tested and checked by the real physical experiments.

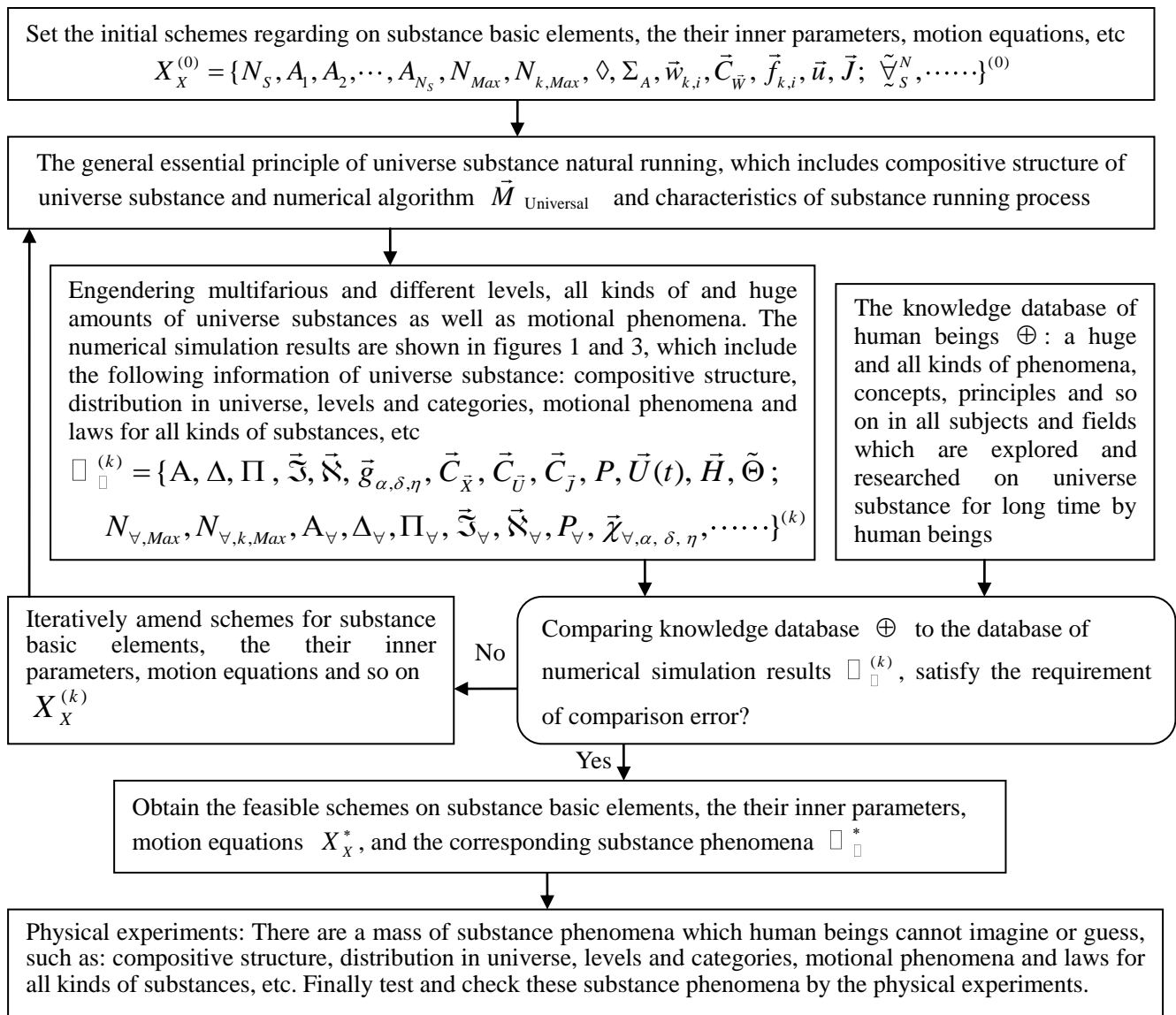


Fig. 6. The algorithm flow chart for global integrative inverse design of universe substance

### 6. CONCLUSIONS

Based on the history and actuality of scientific explorations and researches by humans as well as the general essential principles of universal substance running process, the purposes, methodologies and achievements of scientific researches were systematically summarized, and the results are as follows:

(1) The fact in the past several hundred million years shows: the scientific explorations and researches of human ancestors and humans have already satisfied the subsistences and developments. According to the practical and future requirements for the subsistences and

developments, the purpose selections of scientific researches are roundly and systematically optimized, then idiographic problems are respectively and concretely analyzed, carry out the research purposes by fair means or foul, by using all imaginable technical methods; along with phantasmagoric detailed requirements, the scientific research methods ceaselessly improved, and innovated methods created incomputable new achievements of the scientific explorations and researches, which gradually satisfied various new requirements of the day. These the scientific explorations and researches let human ancestors and humans live through inexhaustible, emerging in endlessly, life-and-death tests, then continually exist and evolve.

(2) The methodologies with human feature were formed for scientific explorations and researches. There are factitious factors in the whole scientific explorations and researches, everywhere. Because the following factors are just considered: all factors which can be apperceived, measured or envisioned by all possible means and equipments of sciences and technologies; catch hold of the primary, lesser and potty factors, ignore these factors which are absolutely neglectable and wondrously jerkwater, as well as the factors which cannot be suppositional, perceptive and measurable by all possible technological means and equipments. The whole knowledge base is divided into a great deal of different offshoot subjects and synthetical subjects.

(3) What humans scientifically explore and research on are just external phenomena of some universal substances and their running processes. The achievements of scientific explorations and researches made up of tremendous, temporarily efficacious and experiential knowledge base, which are called classical theories, and most of which invalidate along with the change of the multidimensional space environments. At all times humans natantly searching for a key inside the maze, that is 【Everlastingly repeat 『Put forward million new ‘why?’s → Select exploratory objects from the new ‘why?’s → By using all possible methodologies of scientific explorations and researches, inexhaustible explorations unknown phenomena → Continuously obtain a series of multitudinous egregious new discoveries, new concepts, great and new breakthrough theories → Those new theories are chronically, extensively and practically proof-test, as well as widely applied in engineering products, etc → Put forward million new ‘why?’ → ……】. The methodologies and achievements of scientific explorations and researches by humans are just similar to ‘natantly searching for a key inside the incomparably abstruse and huge maze on the water, but the key is underwater and underground’.

If humans continuously use the traditional methodologies which are used from of old, the probability is very small for humans to achieve the final purpose of scientific researches. If finally achieve the final purpose, human have to pay out the oversize expenses and spend overlong time.

(4) The future development direction of scientific explorations and researches is to systematically and inversely design on the original fundus of universe substance. Regarding on the above two shortcomings『The methodologies with human feature for scientific explorations and researches』 and 『What humans scientifically explore and research on are just external phenomena of some universal substances and their running processes』, systematically inverse design on the original fundus of universe substance is suggested. The inverse design is based on the general essential principles of substance running process as well as the tremendous, temporarily efficacious and experiential knowledge base obtained by human explorations and researches. The

purpose of inverse design is to search out the most original fundus of universe substances and then easily control all substances in the whole  $N_5$ -dimensional astrospace; and to come true the final intention of humans: To occupy and freely use the whole multi-Dimensional astrospace, as well as all kinds of substances which permeate the whole multi-Dimensional astrospace.

This systematically inverse design is the scientific research methodology for humans to achieve the final scientific research purpose as soon as possible and pay out the minimum expenses.

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