

Modern Social Theories, Some Structures and Equations of Society

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ABSTRACT: First, some modern social theories and new views are investigated. Next, the basic principles of social economics are the production and distribution. They are income and expenditure. The norm of modern society should be freedom of thought and norms of conduct. Only from this way the society can continue to progress. Third, we discuss some social sustainable developed patterns: the nonlinear limit and cycle pattern of three elements, the synergetic pattern on society-economy-environment, and the promotion-restraint pattern on Five-Elements in Chinese traditional culture. Fourth, modern consortium and meaning of *Capital in the Twenty-First Century* are searched. Democracy should evolve from the two-party system in American to the multi-party system in Europe. Fifth, developed universality of the science-technology society and cultural diversity, and possible equations of social evolution are researched. Sixth, hypercycle social structures and justice are discussed. Recently, there has been a trend around the world against equality, democracy and freedom, and try to build the realization of a quasi-authoritarian system. Freedom and equality are always a human ideal and a goal of life for much men and women.

KEY WORDS: *sociology, economics, norm, sustainable developed pattern, consortium, democracy, freedom, equation, universality and diversity.*

I. INTRODUCTION

In 1964 R. Stone divided the social science into two main aspects [1]: 1. The operation of the social system and the association of different parts [2], and analyze the structure. 2. Investigate the rational process of effect and policy formation, namely, control and decision-making. For the equation, both correspond to the constituent equations and their developments, and various solutions of these equations (quantitative or qualitative).

In 1937 Parsons published *The Structure of Social Action*, and proposed general action theory, in which goal, environment and specification are the three essential elements. Later it is developed to the structural-functionalism [3-5]. This is the ways interrelated and interacting units that form the structures of a social system contribute to the development and maintenance of that system. He analyzed large-scale systems and the problems of social order, integration and equilibrium.

We investigated possible unification of some ideal social sciences. The science of law should be based on ethics. Ethics is based on anthropology. Politics should be based on the science of law. The ideal sociology and economics should be based on ethics. Various ideal social sciences should be based on anthropology, in particular, social anthropology and culture anthropology. Further, differences of various nations must exist for some specific rules in social sciences. Therefore, we must study simultaneously universality and particularity in social sciences [6].

We discussed generally the four variables and the eight aspects in social physics, and searched social thermodynamics and the five fundamental laws of social complex systems [7]. Further, we researched social synergetics [8], social thermodynamics, social dynamics and social hydrodynamics [9,10], social extensive electrodynamics and general relativity [11], social individual-wave duality [12], and their applications.

We developed the multi-connected topological economics [13,9] to the multi-connected topological sociology [14], and researched the social field, nonlinearity and their applications [14]. In this paper, we research some modern social theories, the basic principles of social economics, the norm of modern society, modern consortium and democracy, and some stable structures and equations of society, etc.

II. SOME MODERN SOCIAL THEORIES AND NEW VIEWS

Modern social theories are very rich and color [15]. Structuralism [16] advocates holism view, and gives priority to constant things, and recognizes the constraint nature of social structure [15], and generative structuralism [17,18].

Social network reflects a social structure formed by actions and their connections, specifically including structure, resources, rules and dynamic elements [19]. The social network analysis (SNA) is based on the graph theory algorithm. In 2002 Carley proposed the dynamic network analysis (DNA). Nagurney, et al., proposed the supernetwork [20,21], which has multi-layer, multi-level, multi-dimensional, multi-attribute, and coordination, etc. And it has been used in many aspects.

An important character of modern society is increase of means-ends rationality, instrumental-aim rationality, functional rationality and communicative rationality, which is the cornerstone of Habermas critical theory [22,23]. Habermas applied the three basic concepts of communication action, life world and system to analyze and discuss their nature, mechanism and interrelationships in the social process [23].

We discussed various social structures. In Chinese history the typical feudal society is very short and only exists in Western Zhou Dynasty. Then political reform of Warring States was a great social reformation destroyed completely feudal society. Chinese history shows a statistical rule, and forms a super-stable structure, whose base of Chinese traditional thought culture is the Chinese moral educations. It and imperial examinations system and supervise systems, etc., accord with the dissipation structure theory, and provide the governed base of super-stable structure. We researched various stable social structures of different levels. The basis of the modern stable and harmonious society is equality. The comparison and combination at all times and in all over the world will redound to build a perfect society [24].

In some cases, the social sciences are classified according to various physical theories. In sociology, only various elements are completely reduced to the same single particle to basically meet the statistical mechanics, such as in economics, etc. Rational choice theory (RCT) is based on economic approach [25-28]. The spread of RCT is based on morality, culture, Tao, etc. Economic man=social man. Variational principle of sociology is in order to maximizing utility. Based on rational choice and behavior, but the short-term and long-term choices are different [29,30]. Choice between each other and the collective derives the Prisoner's Dilemma and Game theory. The difficulty also lies in the cultural differences, etc [15]. It is related with sociology of culture [31].

Giddens structuration theory is defined as a perspective that emphasizes the duality of structure and agency in shaping social life, where structures are both constituted by human actions and shape those actions in return. In structuration theory [32-36] the duality of structure has three dimensions: domination (power), signification (communication), legitimation (sanctions). Various dimensions may be transformed to other concepts. Trust is a main character of modernity [37]. Structuralism of Yi is an old symbolic dynamics [38], and corresponds to the symbolic interactionism [39] and Chinese Studies in ethnomethodology [40].

Because of the complexity of social phenomena, empirical studies are typical, but rarely universality. The society is variable [4,5,41,42]. Combining evolution, chaos, and thermodynamics, we may discuss the structural changes.

Social structure is a spatiotemporal framework, which determines human big behavior. Otherwise, people can change the spatiotemporal structure more or less. Giddens believes that any change is a combination with the structuration [33]. Large structures correspond to the Kuhn paradigm [43]. A physical mathematical relation between action and space-time structure is general relativity [11]. Schieve and Aleen searched self-organization and dissipative structures as applications in the physical and social sciences [44]. Archer discussed realist social theory as the morphogenetic approach [45]. Kiel and Elliott edited chaos theory in the social sciences [46].

III. THE BASIC PRINCIPLES OF SOCIAL ECONOMICS AND MODERN SOCIAL NORMS

Modern social economics is an important aspect of sociology. This explores a special type of social action, and a basic rational economic action. The basic principles of social economics are the production and distribution. They are income and expenditure, and they are also Yang-Yin.

Both continuous developments are based on innovation and equity. Guan-zi (管仲) said: "Very rich is instigated, very poor shameless (甚富不可使, 甚贫不知耻)." "Very rich and very poor are all lost (贫富无度则失)." Confucius said: "I am not worried about scarcity but about inequality (不患寡而患不均)." They only emphasized the distribution.

Parsons and Smelsel discussed the synthesis of theory in sociology and economy, and proposed behavior-constraint corresponds to the supply-demand [47]. The main foundations for any country are people (men and women) and home, no people, no home, no country. The people and country can form rich people and strong country, rich country and poor people, and many backward countries are poor people and weak country. We introduce the economic fields, including the market, i.e., in which the basic description methods of various mathematical-physical fields can be applied. The key factor in modern society is not the ownership of the means of production, but the actual right of control.

According to the social conflict theory [48,49], the organizational structure of any social system is divided into the rulers and the ruled people, and the corresponding system is divided into the few rulers suppressed the ruled people, or the major ruled people forces to restrain the rulers. Coser believes that conflicts between different social systems contribute to solidarity within the individual systems [50]. Ritzer and Goodman discussed various modern sociological theories [51].

We proposed the principle of social civilization and the developing direction is: freedom of thought, and rule of action. Both combinations should be a peaceful revision and improvement of social rules and laws [52]. This is also the norm of conduct in modern society. Only from this way the society can continue to progress. Different countries and nations, different religions and beliefs should coexist peacefully and compete peacefully. The evolution of human society must be coevolution. Its foundation is the evolution of the human heart and the human nature [52].

IV. Various Stable Structures of Society and Ternary Theory in Chinese Traditional Culture

The ternary theory in society should be politics (management) and economy and science-education-culture stand together. The social structure is the corresponding economic elites, cultural elites (including political and religious elites), and scientific and technological elites. Now some societies are the Trinity: the Holy Father (power, soldier, party), the Holy Spirit (economy), and the Holy Son (scholar). The official standard is a unipolar type, which is unstable.

By structuralism and structuration theory we investigated the Chinese traditional social structure and its super-stable structure [24], and analyzed Chinese society from ancient to modern. Chinese traditional culture emphasizes morality: Ren (Humanity, Benevolence), Yi (Justice, Righteousness), Li (Etiquette, Propriety), Zhi (Wisdom), Xin (Faith, Sincerity) (仁义礼智信) and so on. They go beyond times, and request to constitute various social orders, which bring forward a series of behavior criterions for all persons, and believe “the universe is invariant, so is natural law (天不变道亦不变)” [24].

From collective farms to communes were the serf societies. It accumulates funds for industrial development. Berger and Luckmann discussed the social construction of reality as a treatise in the sociology of knowledge [53]. It corresponds to that Buckley proposed “multiple synthesis” [54].

Modernity has four contents or dimensions, namely industrialism, capitalism, modern supervision system and centralized control of military forces [37].

China is usually considered as a Yin-Yang binary theory. However, in order to promote the exchange of Yin and Yang, a third quantity must be introduced, such as gas as the potential of change. The way of mutual change may be Tao, Li, heart and so on. A Chinese philosopher Lao-tzu (604-531 B.C.) said: Tao produces one, one produces two, two produces three, three produces all things. It shows that three is different with the simplest ‘one’ and ‘two’ (contradiction), three is basis of a new level. From this any complex system and the boundless universe can be formed. It corresponds to energy, mass and information. Yin and Yang are similar to neutron and proton in nuclear structure, but electrons must be added to form the atoms and everything. In the duality of Yin-Yang, Yin corresponds to wave and field, and Yang corresponds to particles. Thus, the SU(2) of Yin-Yang can form a gauge field.

Based on the basic social laws on energy and entropy, we discussed some social sustainable developed patterns:

I. The nonlinear limit and cycle pattern of three elements, our society can form the new self-organization system of the sustainable development [55,56].

II. The synergetic pattern on society-economy-environment developed together. This corresponds to Borromean rings (Fig.1) with three loops in topology [9], here united they stand, divided they fall. It is also a general model with three elements.

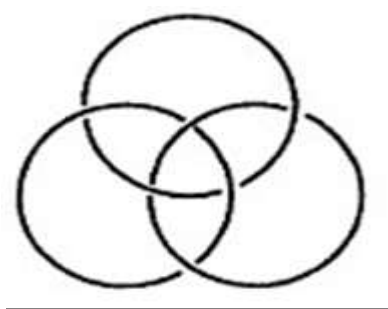


Fig. 1. Borromean rings

Any real law must be based on social justice. Its mathematical representations are symmetry. A developed direction of society is the combination from macroscopic to microscopic order, from an actual capable handling to an ideal pursuance [8]. Further, this Borromean rings may also describe the pattern on society-economy-environment developed together [57].

Combining modern science, the systems theory and the structuralism, and using the mathematical physical methods, I and Zhao-Xiong Huang discussed the three dimensional philosophy for complex systems.

We definite dimension as independent degree of freedom which describes essential character of a system. Further, we introduce a concept: the phase space of philosophy. The complexity of a system depends on the number of elements and on relations among elements in this system. These elements construct a basic frame-space. Here the phase of each element depends together on itself and relations among it and other $n - 1$ elements, this number is just n . Therefore, the number of elements on a system is namely dimension of the phase space of an element. A group of philosophy possesses n -dimensional phase space. We call it n -dimensional philosophy. The materialism and idealism are all one dimensional philosophy. The dualism and dialectics are two dimensional philosophy. Our world exists in an infinite phase space, but for its investigation and description we can apply only a finite dimensional space. The systems theory may describe object, and build framework in n -dimensional phase space. These discussions have something in common with the multivariate history viewpoints, etc.

Three dimensional philosophy possesses some different characters with one or two dimensional philosophy, it has following principles: 1). The structure principle. It is different with isolated one-dimension, or with two-dimension of only simple relation. It can form different structures from the same elements, for example, $A-B-C$, or $A-C-B$, or $B-A-C$, or $A-B-C$, etc. Moreover, three elements may be in different levels. 2). The stability principle. Only in dynamic states (motion, change or struggle) three dimensions can reach equilibrium at rest state, and may be very stable. 3). The complexity principle. Two dimensions are always symmetric as a whole. Three dimensions may be symmetric, may also be broken symmetry. The relations between elements can be common promotion or common restraint. Even in the classical mechanics three body problems has exhibited chaos and complexity, any exact solution cannot be obtained. 4). The nonlinearity principle. Two points determine a straight line, two elements a and b may derive only the linear relation: $y=kx$, where x and y are the arbitrary functions of a and b , respectively. While a and b are independent for $k=0$, both are two isolated 'one'. Only three elements a , b and c can produce various nonlinear relations, for example, $z=kxy$, $z = f x^{hy}$, etc. While $z=kx+hy$ is still linear relation. From this the system can derive the dissipative structure and synergetics, and form the self-organization. Only the nonlinearity may obtain chaos, and relate to the intrinsic stochastics of system.

III. The promotion-restraint pattern on Five-Elements. Combining Chinese traditional culture, we propose the promotion-restraint sustainable developed pattern on the Five-Elements (Fig. 2), which include social (S) progress (democracy, justice, stabilization), economical development (F), science-technology (K), education-civilization (J) and environment-resource (H).

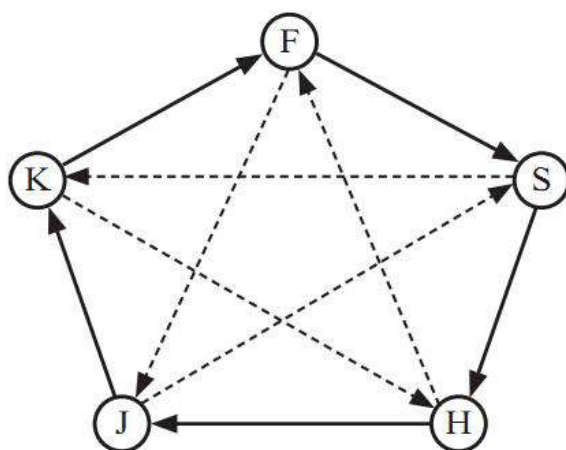


Fig.2 Promotion-Restraint Developed Pattern on the Five-Elements

Here a solid line represents a promotion relation, and a dotted line represents a restraint relation. Both relations are all internal interactions in a system. In graph theory the promotion and restraint relations are just a graph isomorphic to its complement [58].

Assume that society has four parts: A is agriculture, various industries that are the production cells of the society. B is business, transportation and money that are all for circulation. C is science and technology, education and energy that are the thought and the driving force of material on social development and progress, and are the promoters. D is government and politics that are management and regulators. A and B are creating wealth, and D is distributing wealth. Any four elements can attempt to apply both quaternions and torsion. Further, it can form five-element and n-element structures. And they may combine our five-element social mechanism.

We researched the eastern economics and its three principles: 1. The common restraint or common promotion principle of the Yin-Yang and the Five-Elements; 2. the whole principle of heaven-humanity-earth; 3. the cycle principle of some elements. Its major characteristics are entirety, balance and harmony. The highest aim is the principle of unified nature-human-society harmony. The sustainable developed patterns should be unification of human-nature, are a harmonious development of society-economy-environment. The old and modern methods compare and combine, we will enlarge thinking domain, and will obtain possibly inspiration for development of modern sciences. Further, we should research the completeness of the supervision, from the separation of the three powers to the five powers.

These social sustainable developed patterns are based on the states with lower entropy, even entropy decrease. Entropy is join, intersection and interaction between natural science and human mind-society. We proposed that if internal interactions exist in isolated systems, entropy decrease will be possible for this system. Management in system is a typical internal interaction within the isolated system. The purpose of management is to use regulating the internal interactions within the system, and to decrease the increasing entropy spontaneously [52].

In the American power structure, this model is a Pyramid structure [59], whose power elites are composed of corporate community, policy-making organization and social upper class [60]. In the pluralist model three theories of social change are: 1). The social evolutionary theory, but as Ellen Glasgow said, not all changes are development, not all movements are progress. 2). The social equilibrium model, Parsons proposed four processes: differentiation, adaptive upgrading, inclusion, value generalization. 3). Third are resources, power and change.

The theory of social exchange focuses on the micro theoretical basis, emphasizes people, and attributes human behavior to the pursuit of maximum interests. Blau proposed the overall effect [61], and then proposed the macrostructure theory [62].

Democracy should evolve from the two-party system in America (origin from the Great T. Jefferson) to the multi-party system in Europe. For example, Musk proposed new America Party. The two-party system is black or white, the interests of the Party are above all else. It completely ignores basic morality and international credibility and blindly opposes each other. This leads to few person retroacts action. Democracy must adhere to the separation of three powers (Fig.1), otherwise which will be controlled by one party.

V. Consortium and Meaning of Capital in the Twenty-First Century in Modern Society

Social conflict theory emphasizes the compulsion of social structure, the conflict of social processes and the universality of social change [63]. Modern western society forms the new trinity of consortium, media and regime, but they are not equilateral triangles, in which consortiums occupy their core forces, and controlling the media and thus manipulating the regime. This forms a slaving principle in synergetics, and corresponds to the consortium and Capital in the Twenty-First Century [64]. For society developments any big consortiums must be prohibited. Trust must be under state control. This should be similar to the antitrust method of T. Roosevelt (1858-1919). Otherwise it must be split.

The regime has no big restriction ability on the consortium-dominated market economy and finance; it has only "limited restriction" ability on the media under the consortium control. But, the consortium had strong power over the regime through its two magic weapons: money and media. This reason is very simple: All western developed democratic regimes are by the election, and has a clear "life" and certain transparency. While the consortium is always hereditary, and will always be "black box", and no external force can penetrate, nor any external force can really restrict their power. In theory, the government serves the people, while the monopoly consortium has its sole goal to maximize its own profits. In many cases, government departments are often controlled by monopolies and implement policies that profit monopolies rather than serve the interests of the people. So consortium is the true "shadow government". To control the media is to control the election.

Mass media, including newspapers, film and television, advertising and other forms, is mainly controlled by some consortiums. At present, only the international Internet truly enjoys a certain degree of "actual freedom". To analyze and understand the tripartite composition and mutual relationship and function of consortium-regime-media are the key to understand the democratic system of western developed countries.

In *Capital in the Twenty-First Century* [64], Thomas Piketty analyzed the data of wealth distribution since the industrial Revolution in the 18th century. He believes that the unchecked capitalism led to the aggravation of wealth distribution inequality, which cannot be solved completely by the free market economy. Capitalism automatically generates arbitrary and unsustainable inequalities. Piketty suggested restricting capitalism through democratic institutions to effectively reduce wealth inequality. The traditional methods are to make anti-trust laws, regulate taxes, and build a welfare society. To solve this problem, it must take the extreme measure of high tax on high wealth groups and capital.

The government structure should be the separation of the three powers. For society the focus is on the industrial structure. Each element in social cell of the society is too large, or too bloated will hinder the circulation, and forms social cancer cells, and lead to cancerous society. Almost all the crises of the whole society are origin of this. Ecological crisis is the depletion of resources, and environmental pollution. Population aging is more life, and less death. So the institutions must be streamlined.

VI. Developed Universality of Science-Technology Society and Cultural Diversity, and Social Evolution Equation

Basic social dimensions mainly include economy (which is the material basis of society), culture (including religion, etc), and science and technology (including scientific education). Among them, education and science-technology are the necessary conditions for modern social development, and religion is the most important guarantee for social stability. Economy, science and technology are universal, while culture, religion and corresponding education are national and regional. When we lose our culture, we also lose our nationality. Politics does not constitute the basic dimension of society. This organization is stable and has three pillars. Our ideal life and society should be to pursue the truth, goodness and beauty [65].

In modern sociology Manuel Castells published *The Information Age: Economy, Society and Culture* [66-68]. Information, network and globalization are all the commonness of development around the world [51]. World should remain the cultural diversity [6], such as Japan and India.

Fligstein and McAdam proposed that social change and social order can be understood through the strategic action fields, which draws together far-ranging insights from social movement theory, organizational theory, and economic and political sociology to construct a general theory of social organization [69].

Mathematically universality and diversity can be turned into general equations and particularity. This even may reduce to an equation of social development, such as synergetic equations, its general and special solutions for different initial conditions and boundary conditions.

We propose the simplest differential equation of first order as social evolution:

$$\frac{dS}{dt} = aS + F(S, t). \quad (1)$$

1. If $F=0$, its solution is $S = Ce^{at}$. But, society cannot develop exponentially.

2. If $F = eS^m - bS^n + \Gamma(t)$, it will be

$$\frac{dS}{dt} = aS + eS^m - bS^n + \Gamma(t). \quad (2)$$

It is nonlinear theory of economic and social evolutions, and $\Gamma(t)$ is a stochastic term [7]. Let $e=0$, $n=2$

and $\Gamma(t)=0$, Eq.(2) will be simplified to the logistic equation:

$$\frac{dS}{dt} = aS - bS^2. \quad (3)$$

Its solution is:

$$S = \frac{a}{b(1 + Ce^{-at})}. \quad (4)$$

This may be extended to apply the economic growth and social evolution, and derived three laws: Economic takeoff-growth-stagnancy law, social conservation and economic decay law, and economic growth mode transition and new developed period law [7]. The social open-reform is a necessary and sufficient condition for further economic development.

3. If $a = -t^2 - 1, F = S^2 + 2t$, Eq.(1) will be Riccati equation

$$\frac{dS}{dt} = -(t^2 + 1)S + S^2 + 2t. \quad (5)$$

Assume $u(t) = S - t^2 - 1$, Eq.(5) becomes Bernoulli equation.

4. If $aS + F = 1 - \mu S^2$, Eq.(1) becomes:

$$\frac{dS}{dt} = 1 - \mu S^2. \quad (6)$$

It is an equation with chaos solution. This may describe many chaos phenomena in economics and sociology, etc [46].

5. If $F = f[\sin(t)]$ is a trigonometric function of time, Eq. (1) will be

$$\frac{dS}{dt} = aS + f[\sin(t)]. \quad (7)$$

It can describe the circular society. If $F = C(\cos t - a \sin t)$, its solution will be the simplest $S = C \sin(t)$.

6. If $a = -\sin(t), F = S^2 + \cos(t)$, Eq.(1) will be:

$$\frac{dS}{dt} = -(\sin t)S + S^2 + \cos(t). \quad (8)$$

A solution of this Riccati equation is $S = \sin(t)$. And it has also other solutions.

VII. Hypercycle Structures in Society, Justice and Social Integrity

General theory divides three industries: 1. Products directly from the nature, such as agriculture, animal husbandry, fishery, mining, salt production, etc. 2. Processing raw materials are produce new products, general industry, and construction industry. 3. Business, service industry, transportation, culture and education, etc. This is based on the one-way flow of resources.

The recycling economy based on sustainable development must redivide the industries, and form a hypercycle [70].

1) Cycle structure of the resources. The simplest thing is to develop the waste recycling industry to form a three-element cycle, which is the ancient Chinese agriculture. This is a big cycle, and each element is a small cycle, so form a hypercycle [55]. This may combine the ternary philosophy.

Fallen flowers are not merciless and useless

They transform manures, and enrich flowers.

(落红不是无情物,化作春泥更护花.龚自珍)

It is a poetic recycle.

2) A human-centered cycle. All three industries are around men (women), especially the third product is the most obvious. First, the natural cycle, birth, aging, illness and death, including medicine, health care, pension. The second is the circular development of material-morality, including science and technology, education, culture and so on. The two aspects are closely related, and form a hypercycle. This is also the development of social synergetics [53].

Food, clothing and house are the basic conditions of individual survival, sex is the population survival, and the right is a higher level of development requirements. This is the stereoscopic evolution. 1) and 2) become a unified system of human-society-nature. The basis element of further society is man (woman), and analyzes their basic components.

3) The ideal structure of the society must reflect the cycle. Society is a big cycle, and each element is a small cycle, such as education, science and technology, culture, management and social development are cycles each other.

After hundreds of millions of years of evolution, the self-organized nature had formed many perfect cycles. Man complies with the earth, earth complies with heaven, heaven complies with Tao, and Tao complies with nature (人法地，地法天，天法道，道法自然). Man must learn from nature and form a perfect cycle to achieve sustainable development.

Social science and collectivism, and nonlinear whole sociology form the community of justice and a shared future for mankind. Because institutional fairness is the source of people's happiness, and is also the fundamental to social stability and solving people's livelihood problems.

From the cooperation of ancient humans may over other species, a big synthetic country may defeat over other countries, the cooperation of all mankind may overcome various difficulties.

Justice is just conduct. Epicurus said that justice has only one basic function: to make people help each other, and prevent hurting or being hurt by others. It is a contract, and an agreement of non-aggression and cooperation established by people who are both interdependent and threatening. Hobbs agreed that the foundation of justice is human agreements, whose function prevents people from infringing on others while pursuing selfish interests, but there must have a central power. It is consistent with natural law. J.J. Rousseau proposed the social contract theory.

Nature places man under the rule of the two supreme masters of pain and pleasure. Only they can point out what we should do, and only they can decide what we should do [71]. Both the Stoics and Epicureans valued everyday advice on tranquility, though they different differently.

Cooley defined that freedom is getting the right development opportunity [72]. Freedom must control individual behavior through human reason, conscience and self-esteem, and can only be achieved through social order. Marcuse proposed freedom and reason are inseparable [73], and only following reason can be freedom. In the modern society built with the help of reason and science-technology, the rule and control for human not only never disappeared, but sometimes became more severe and more rigorous.

Recently, there has been a trend around the world against equality, democracy and freedom, and try to build the realization of a quasi-authoritarian system. In 2011 Dobbin documented the entire transformation process of equal opportunity from law to practice [74]. Freedom and equality is always a human ideal and a goal of life for much men and women.

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