

# Balanced and Coordinated Development of Chemistry in China

He Tianping<sup>1</sup> Wang Fei<sup>2</sup> Ding Hong<sup>1</sup> Xing Jiangping<sup>1</sup>

(1 Research Center for Philosophy of Science and Technology,

Shanxi University, Taiyuan 030006, P. R. China ;

2 College of Physical Education, Shanxi University, Taiyuan 030006, P. R. China)

*Balanced and coordinated development of Chemistry has narrow sense and generalized comprehension. The former only refers to the balanced layout and coordinated development among "every discipline and specialty in chemistry", and the latter taking the balanced layout of discipline as core and synthetically balancing the talent troop, the region distribution, the national strategy demand as well as the social affect and so on. At the present, the chemistry in China totally represents discipline balance and coordination, and interdisciplinary is obvious.*

**Key words** chemistry; discipline balance; coordinated development

## 1 Comprehension of discipline balanced and coordinated development

The experience of science development in innovative countries shows that discipline balanced layout and coordinated development is a necessary basis that improves integrated science and technology of one country, and also an important guarantee that encourages scientists explore freely and promote initiative innovation.<sup>[1]</sup> On comprehending its further meaning, we can explain from narrow and generalized sense.

### 1.1 Narrow comprehension

Narrow comprehension only refers to the balanced layout and coordinated development among "every discipline and specialty", without considering region, talent and resource etc.. Referring to chemistry, it includes three aspects.

First, it is the balanced layout and coordinated development among every direction that is under ev-

ery relatively independent secondary discipline. Its every research direction consists of integrity that supports the development of secondary discipline and promotes the development of chemistry.

Second, it is the balanced layout and coordinated development of seven secondary disciplines that belong to its first level subject. Together, they are a uniform and steady integrity. Unbalancing any secondary disciplines will lead to key excursion of first subject, which in turn, causing discipline unhealthy development. Every direction, every discipline, every science develops independently, as well as inter-coordinates that promoting chemistry whole.

Third, it is the balanced layout and coordinated development of chemistry and chemical industry and other disciplines under mutual science disciplinary system. High speed development of chemistry is basing on the discipline crossing which consists of a larger integer. Chemistry is combining with life science, math and physics science, material and engineering science, information science, geosciences and environment, energy, resource science etc., producing many new subjects that construct new developing space of chemistry and chemical engineering. (Fig 1-1 Comprehension of discipline balanced and coordinated development: only for inner contents.)

The importance of the balanced layout and coordinated development of chemistry can be explained by "cask effect". We imagine chemistry as a cask, then every secondary discipline and direction of chemistry are just like boards. When any one of them is lower than others, the height of the whole water is also low.

Therefore, the weakest factor is the key of integral development of subjects. That is, the balanced layout and coordinated development of chemistry secondary discipline is the premise of its integral development.

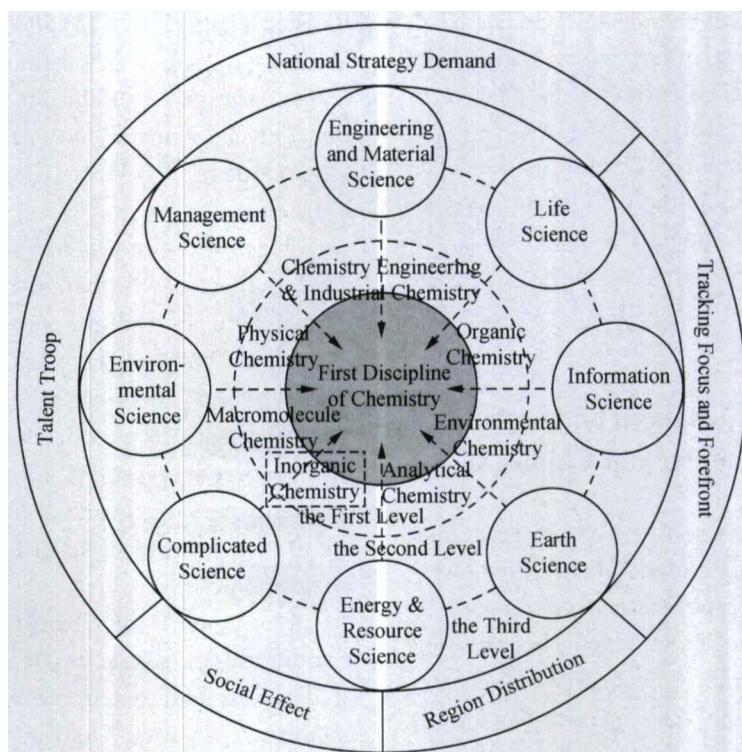


Figure 1-1 Comprehension of discipline balanced and coordinated

## 1.2 General comprehension

It is the synthetical equilibrium of talent rank, region distribution, national strategy demand, tracking focus and forefront, social effect and so on. On chemistry, general Comprehension is the balanced layout and coordinated development that is decided by many elements. (Fig 1-1 Comprehension of discipline balanced and coordinated development: only for the most outer contents) The elements including:

(1) Discipline layout. Its balanced layout and coordinated development usually is the narrow sense accordingly. On the basis of stable layout, grasping "cold subject" and "hot subject"; sustaining "superiority discipline" and supporting "weak discipline" equally; impelling longitude development and encouraging transverse development in the same way.

(2) Talent troop. It focuses on stabilizing scientific research and encouraging interdisciplinary, as well as solving alternation of new and old talents and cultivating outstand persons.

(3) Region distribution. As the development of national economy in every area, the strength and tendency are different. From region distribution, the disciplines also need a relatively equilibrium and harmony. Leading discipline development in developed areas and impelling subject progress out-of-the-way

zones at the same time, minimizing region difference and encouraging priority development.

(4) National strategy demand. Besides satisfying personal interest, it should attend actual requirement of country, society and economy development. Encouraging explore freely and satisfying national need comparably, taking basic research and application as the same, considering short-term demand and long-term development equally.

(5) Tracking focus and forefront. We both emphasize fostering stable disciplinary basis, avoiding longing for instant benefit; and trending for paying attention to some potential or advanced aspect. Thus, stabilizing the development of well-researched subjects, and also making someone insists on researching inferior disciplines (including new embryo disciplines, frontier subjects and inter disciplines) that avoiding hindering the development of future science. Actually stabilizing subject basis and tracking focus and advanced science, as well as fully developing and emphasizing keys equally.

(6) Social effect. Development of discipline is certain to be effected by social environment that is indispensable, such as politics, economy, education, culture and social concepts etc.

It is not actually the balanced layout and coordinated development that when discipline is confined in the independent factor development but ignores its in-

egrated factor progress; when subject is restricted to simple addition of every element while neglects its combination; when discipline is limited to short-term view whereas ignores its future construction.

In a word, balance and coordination is the cooperative development of disciplines. "Optimization of combination" and "Maximum of performance" are that every element of accelerating chemistry development is best, which contributes most to science and our country.

## 2 Present condition of balanced and coordinated development of Chemistry in China

Comparing with development of international chemistry, it has improved remarkable in China in recent decade. Liang Wenping, associated director of chemistry in China Science Foundation Commission, indicated that basic research of chemistry and chemical engineering in China has achieved glorious progress and a lot of excellent research talents displayed their novelty, their strong potential and their confidence, become the projected battleship in the fundamental research of China.<sup>[2]</sup> He also presented expected effect of chemistry and chemical industry in China from international paper citation, great achievements, outstanding talents, chemistry brand and innovation culture etc.

According to statistics of "Status investigation on balance and coordination of chemistry in China" in 2006, displaying that development of chemistry in China is relatively equal.

In view of balanced and coordinated development of chemistry and chemical engineering, several features are as follow:

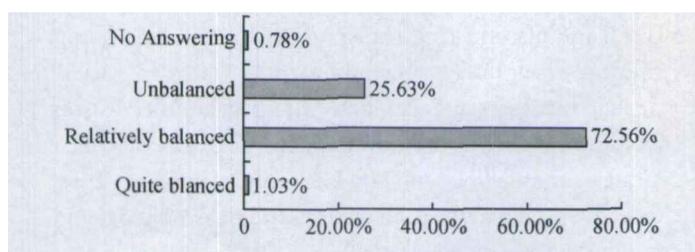


Figure 1-2 Questionnaire of Balanced Development on Chemistry in China

Note: the statistics are from statistical data of questionnaire on "Impelling the Balanced and Coordinated Development of Chemistry, Perfecting sustentation fund Mode"

First, general development is in equilibrium.

Results indicate that 72.56% of scholars think that general development of chemistry and chemical industry is "relatively equilibrium", few scholars consider that imbalance mainly focuses on region. (Fig 1-2: Questionnaire of Balanced Development on Chemistry in China)

Moreover, intersection is obvious. Inter-discipline is the most important character of disciplinary development in the process of science promotion. "Discipline intersection" is research of "discipline boundary" or "crossing subject". Science history displays that science experiences synthesis, differentiation, and re-integration. Modern science is both hi-differentiated and hi-integrated, while cross science integrating synthesis and differentiation, realizing its integration.<sup>[3]</sup>

Development of chemistry taking a new look. For one thing, science research continuously develops at deepness and extent. Some new front fields of chemistry, such as biology, theory and calculation chemistry, molecular dynamics and super molecular Chemistry etc., are increasingly appearing. For another, intersection of chemistry and natural science, as well as natural science and the humanities leading to the forming of new research fields. For examples, life has been researched by physicists, chemists and information scientists; because researches of atomic and molecular excited state and state to state reaction, boundary of physics and chemistry is obscuring.<sup>[4]</sup> Discipline intersection has been period features of science development.

National discipline intersection and interdisciplinary science are relatively lagging. In a rather long period, there exists insurmountable gap among natural science, social science and humanities etc., while science development, society process and economic development all need intersection and penetration of every science and every discipline.

Related departments in China implemented a series of great transform to strengthen discipline intersection and develop cross-disciplinary science: in aspect of science policy, leading and encouraging engaging research of cross science; on organization and management, attaching importance to the development of cross science, even concrete research projects, as well as supporting disciplinary intersection and cross science in thesis n and cross science. Also, in order to better fit to foundation application of inter-discipline and need; in learning atmosphere, con-

structuring favorable environment that is suit to disciplinary intersection of sustentation, NSFC carried out some measures, such as editing foundation application code. According to questionnaire, 64.29% experts think that editing foundation application code “should adapt to disciplinary intersection, penetration and fusion”, which showing up that experts pay much attention to discipline intersection and fusion.

Discipline intersection is always a new generative point, as well as a new forefront, where most probably produces significant science breakthrough that causing revolutionary transformation of science. Meanwhile, interdisciplinary science is results of synthesis and inter-discipline, thus it is convenient for

human to settle important and complicated science problems.<sup>[3]</sup> Therefore, discipline intersection is must be further close attended.

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