

# A Study of the Evaluation of the Development of Natural Science Research in Local Normal Universities

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**Abstract.** Using CiteSpace as tool, this paper analyzes SCI journal papers published by faculties of Yunnan Normal University (YNNU) from 2003 to 2016 from five aspects (distribution of disciplines, distribution of years, research hotspots, distribution of journals and funding) and draws conclusions, so as to put forward some suggestions to promote the rapid development of natural science research of YNNU, at the same time provide a reference for local normal universities and colleges to establish a more objective and fairer academic evaluation system for natural science research.

**Keywords:** SCI, Natural Science, Statistical Analysis.

## 1. Introduction

The quantity and quality of academic papers are important indicators of the development, strength and innovation capacity of natural sciences in a university, a region or an industry. The Science Citation Index (SCI) is a citation index originally produced by the Institute for Scientific Information (ISI) in Philadelphia in 1957 and published in 1961, also by ISI. SCI is an internationally recognized search tool for scientific statistics and scientific evaluation; the number of academic papers indexed in or cited by SCI is an important criterion for the evaluation of academic level in many universities [1].

Using CiteSpace as tool, this paper analyzes SCI journal papers published by faculties of Yunnan Normal University from 2003 to 2016 from five aspects, namely (1) distribution of disciplines, (2) distribution of years, (3) research hotspots, (4) distribution of journals and (5) funding, aiming at promoting the rapid development of natural science research of YNNU.

## 2. Data Collection

Data used in this paper are derived from Web of Science. By logging onto Web of Science (<http://www.webofknowledge.com>), entering “Address = Yunnan Normal Univ AND Year Published = (2003 - 2016)”, a total of 1754 papers indexed in SCI in the past 14 years are retrieved.

## 3. Data Analysis

### 3.1 Distribution of Disciplines

The discipline classification of the paper is based on the classification of Web of Science database. According to statistical analysis, the 1754 natural science papers are mainly distributed in 10 disciplines (see Figure 1). Statistics of the papers published the past 14 years reveal unbalanced development of various disciplines. There are 741 papers on chemistry and mathematics, accounting for 42.5% of the total, which shows that fruitful results have been achieved in chemistry and mathematics research; the two disciplines, as the strongest in Yunnan Normal University, can be considered as the preferred options for applying for doctoral student cultivation stations.

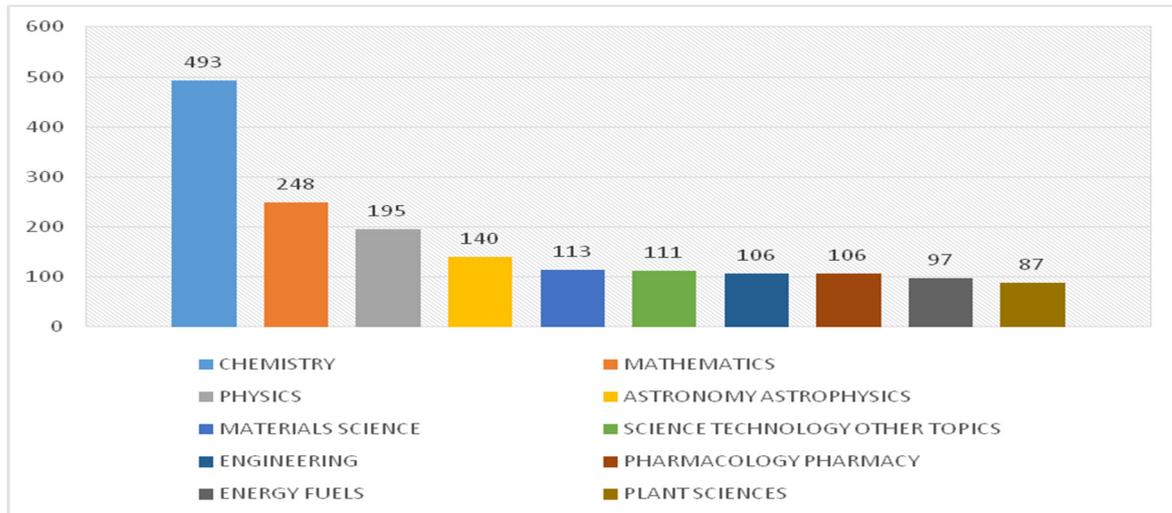


Figure 1. 10 disciplines with the most SCI papers from 2003 to 2016

There are two disciplines with less than 100 papers indexed in SCI, they are energy fuels and plant sciences, accounting for 10.49% of the total, which indicates that these two disciplines have limited research scale, limited output, and are at a low development stage. There are six disciplines with 100-200 papers indexed in SCI, they are physics, astronomy astrophysics, materials science, science technology other topics, engineering and pharmacology pharmacy, accounting for 43.96% of the total, which indicates that these six disciplines are the most competitive ones of YNNU and should be given the greatest support during the 13th Five-Year Plan period (see Table 1).

Table 1. Number and proportion of SCI papers of the top 10 disciplines

Quantitative Range of Papers Indexed in SCI	Number of Disciplines	Percentage (%)	Number of Papers Indexed in SCI
≥400	1	493	28.11%
200-400	1	248	14.14%
100-200	6	771	43.96%
≤100	2	184	10.49%
Total	10	1695	96.70%

### 3.2 Distribution of Years

The number of SCI papers has been increasing since 2003 and peaked in 2016 with a total of 274 papers indexed, which shows that the natural science research of YNNU enjoyed a rapid development during these years (see Figure 2). In the past 14 years, the number of papers indexed in SCI has witnessed a nine-fold increase: from 31 in 2003 to 274 in 2016.

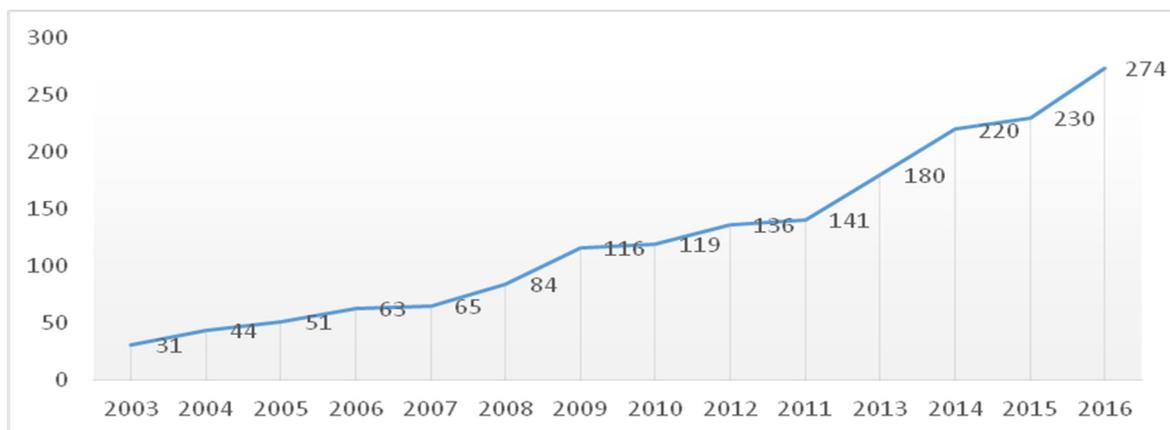


Figure 2. Number of papers indexed by SCI from 2003 to 2016

### 3.3 Research Hotspots

According to the mechanism of CiteSpace, keywords with the highest frequency of appearance represent the issues researchers focus on in a certain period of time, namely, research hotspots. The more frequent a keyword appears, the more important the issue is. As shown in Figure 3, in the SCI papers published by faculties of YNNU from 2003 to 2016, keywords with the highest frequency of appearance are “Active Galactic Nuclei”, “Nanoparticle”, “Crystal structure”, “Soliton Solution” and so on (see Figure 3), which reflects that most research in YNNU are focused on astronomy, materials and soliton solution, indicating a relatively unbalanced distribution of disciplines.

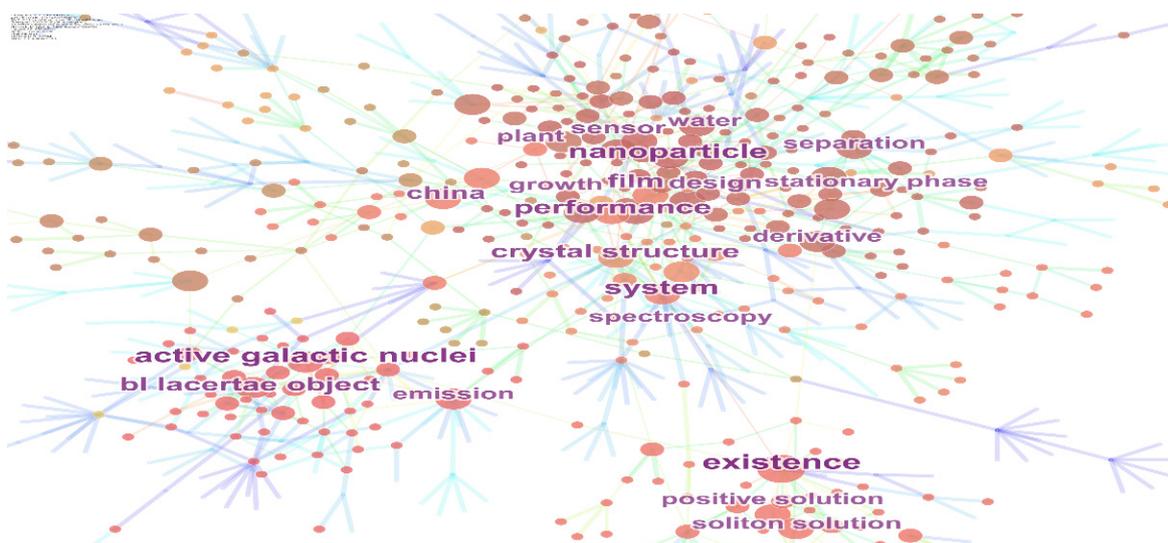


Figure 3. Research hotspots in papers indexed by SCI from 2003 to 2016

### 3.4 Distribution of Journals

Table 2 shows that 42 papers are published in Spectroscopy and Spectral Analysis, accounting for 2.4% of the total; this journal has published the biggest number of papers by faculties of YNNU. The data in Table 2 shows small differences among journals, indicating that the university has a wide range of journal choices.

Table 2. 10 Journals publishing the highest number of SCI from 2003 to 2016

Journal Name	Number of Papers	Percentage (%)
SPECTROSCOPY AND SPECTRAL ANALYSIS	42	2.40%
NONLINEAR ANALYSIS THEORY METHODS APPLICATIONS	35	2.00%
CHEMISTRY OF NATURAL COMPOUNDS	33	1.88%
ACTA CRYSTALLOGRAPHICA SECTION E STRUCTURE REPORTS ONLINE	27	1.54%
ACTA PHYSICA SINICA	27	1.54%
ASTROPHYSICS AND SPACE SCIENCE	26	1.48%
JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS	24	1.37%
JOURNAL OF ASTROPHYSICS AND ASTRONOMY	22	1.25%
PLOS ONE	20	1.14%
CHINESE CHEMICAL LETTERS	19	1.08%

### 3.5 Funding

Among all the funding agencies (see Figure 4), National Natural Science Foundation (NSFC) made the biggest contribution (60.66% of the total, nearly 10 times of the second-ranked agency), indicating

that NSFC has played an important role in supporting the publication of papers written by faculties of YNNU.

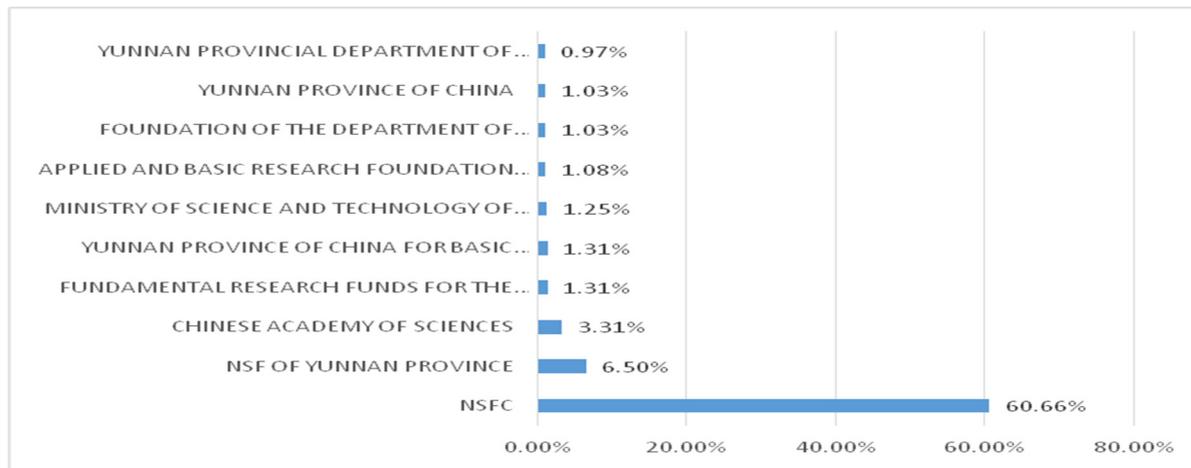


Figure 4. The funding agencies in papers indexed by SCI from 2003 to 2016

## 4. Conclusion and Suggestions

### 4.1 Conclusion

Based on the analysis of papers indexed by SCI from 2003 to 2016, the following conclusions are drawn: 1) the development of various disciplines is uneven and unbalanced; 2) YNNU has a wide range of journal choices; 3) the natural science research of YNNU has been enjoying a rapid development; 4) the National Natural Science Foundation (NSFC) is the No.1 funding agency for YNNU.

### 4.2 Suggestions

Based on the analysis of papers indexed by SCI, the following suggestions are put forward:

(1) Give full play to the strengths of competitive disciplines; further refine disciplines, pool talents, create new scientific research momentum through teamwork; facilitate cross-disciplinary integration, tap new sources of scientific research, and gradually build the capacity of continuous innovation.

(2) Introduce an implementation plan for first-class disciplines construction; integrate manpower and material and financial resources to construct competitive disciplines with distinctive characteristics. Establish a dynamic adjustment mechanism for master's degree and doctor's degree authorization stations, as well as professional degree authorization categories. Promote the formation of reasonably structured, distinctive and competitive master's degree authorization stations and professional degree authorization category system; apply for new doctoral degree authorization stations, make overall planning and adjust distribution, striving to expand the list of doctorate disciplines in YNNU.

(3) Stimulate innovation and vitality, improve the quality of innovation, and establish a standardized, open, cooperative and efficient modern scientific research management mechanism. Promote the reform of organization styles of scientific research, improve scientific research management, and gradually introduce highly educated and capable talents to strengthen the scientific research management team, speed up the improvement of scientific research evaluation system, and provide more-generous incentives for great achievers.

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