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## Introduction

Scholarly publishing is being confronted with the challenges and opportunities of a post-Web 2.0 age. The list of digital publishing platforms employing ‘publish then filter’ or light/open/social peer-review approaches is lengthy and growing: arXiv,<sup>1</sup> Nature Proceedings,<sup>2</sup> Liquid Publications,<sup>3</sup> and PLoS ONE<sup>4</sup> are just four of the better-known platforms using such approaches to enable open, instant and quality-controlled exchanges of scholarship and to enable sharing and collaboration among academics. These models have many advantages: they help to reduce delays associated with traditional publishing processes and mitigate the risk that good ideas may be prevented from entering scholarly discourses as a result of inappropriate filtering by gatekeepers. They are thus seen as a valuable strategy for facilitating ‘a dialogue between scientists without mediation or obstacles’.<sup>5</sup> Commentators such as Surridge believe that the open, social, and collaborative affordances of digital technology perfectly complement scientific processes because scientific knowledge is built up by ‘crowd-sourcing’ the contributions of peers and then ‘refining that knowledge through open debate’.<sup>6</sup>

However, in practice much of the potential for more open knowledge certification and peer-review approaches arising from digital technology remains latent in the world of academic publishing. Although some influential new platforms are beginning to emerge, the majority of academic publishing continues to operate according to traditional models of review and evaluation.<sup>7,8</sup> A key reason for this is that the frameworks that academics must operate within continue to reflect (and demand) more traditional approaches to scholarly communication. According to Ponte, although scholars themselves are broadly positive about collaborative and Web 2.0-inspired models of publishing, the combination of open approaches with robust and reliable quality-

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# Beyond online preprints: formalization of open initiatives in China

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**ABSTRACT.** *A growing number of online journals and academic platforms are adopting light peer review or ‘publish then filter’ models of scholarly communication. These approaches have the advantage of enabling instant exchanges of knowledge between academics and are part of a wider search for alternatives to traditional peer review and certification processes in scholarly publishing. However, establishing credibility and identifying the correct balance between communication and scholarly rigour remains an important challenge for digital communication platforms targeting academic communities. This paper looks at a highly influential, government-backed, open publishing platform in China: Science Paper Online, which is using transparent post-publication peer-review processes to encourage innovation and address systemic problems in China’s traditional academic publishing system. There can be little doubt that the Chinese academic publishing landscape differs in important ways from counterparts in the United States and Western Europe. However, this article suggests that developments in China also provide important lessons about the potential of digital technology and government policy to facilitate a large-scale shift towards more open and networked models of scholarly communication.*



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control mechanisms<sup>9</sup> will be vital to the wider adoption of more open publishing platforms and ensuring that academic contributions to such platforms are recognized and rewarded. As Ted Freeman<sup>10</sup> points out, until these platforms are brought within institutional evaluation frameworks, their use by career-minded academics will remain limited.

Chinese open publishing platforms have been emerging since around 2003 when some influential platforms were launched<sup>11</sup> including integrated open publishing mandates such as Science Paper Online,<sup>12</sup> online preprint platforms such as Miracle Repository<sup>13</sup> and the preprint service provided by the National Science and Technology Digital Library,<sup>14</sup> academic blog and social networking portals such as Science Net,<sup>15</sup> and social reference management sites such as New Science.<sup>16</sup> Like their Western counterparts, these initiatives have the potential to change profoundly the academic publishing landscape through the incorporation of Web 2.0 digital affordance into scholarly communication models. However, as in other markets, these platforms also face major challenges in terms of establishing credibility, maintaining quality, and being accepted within existing academic assessment frameworks.

There are also important tensions between the ways in which Chinese universities and publishers operate and the ways open initiatives function. The Chinese government continues to maintain direct control over both higher education and the publishing industry.<sup>17</sup> As a result, academic publishing in China is often shaped by government policy and regulations rather than by market dynamics. Furthermore, in contrast to the high levels of commercial concentration that exist in the Anglophone world of academic publishing, China's publishing industry is highly fragmented. Most publishers have just a handful of journal titles.<sup>18,19</sup> One result of this is that Chinese academic publishers have limited commercial, financial, and technical capacity and are thus reluctant to engage with digitization or new business models.<sup>20</sup> In this context, digital aggregators, government organizations, research institutions, and even scientists themselves are leading the shift to digital. Finally, the current academic publishing system in China has only been operating for a

little over 30 years.<sup>21</sup> Although it has grown rapidly during this time, it is unsurprising that China's academic publishing system contains areas of profound inefficiency and corruption, or that many academics are not satisfied with it.<sup>22–24</sup>

Within this context, this paper examines the design, implementation, and challenges faced by an influential open publishing initiative in China: Science Paper Online ([www.paper.edu.cn](http://www.paper.edu.cn)). Science Paper Online is supervised and operated by the Chinese Ministry of Education, and has become well known within China for its 'publish first, peer review later' approach, which enables 'fast exchange and instant adoption' of the latest research findings without the 'need for traditional publication procedures such as peer reviews, revision, editing and printing'.<sup>25</sup> In contrast to online preprints platforms, Science Paper Online combines a 'publish then filter' model with rigorous academic quality control and the administrative authority of the Ministry of Education. The inclusion of these formal quality-control mechanisms and support from the Ministry of Education are encouraging Chinese academic communities to regard open online publishing as a legitimate and useful channel for scholarly communication.

### Overview of Science Paper Online

The Chinese Ministry of Education launched Science Paper Online in 2003. The decision by the Ministry of Education to launch and operate the site directly was intended to address growing problems within China's traditional journal system, particularly extended delays between submission and eventual publication of scholarly outputs and concerns within academic communities that the established peer-review system lacked transparency and accountability and was not operating effectively. In particular, academics were concerned that some reviewers were rejecting good-quality papers and plagiarizing submitted work. In order to address this problem, Science Paper Online employed a 'publish first, peer review later' policy, promising authors that papers would be published just one week after submission. Post-publication peer review and social peer review were adopted to assess and indicate the quality of papers on the platform.

Like most digital publishing platforms, Science Paper Online was not an instant success. In its first few years the platform struggled to raise its profile among academics and to attract submissions. In 2005 the platform was receiving just 300 submissions a month.<sup>26</sup> However, by 2011 this had risen to 3,000 submissions each month.<sup>27</sup> Since its establishment in 2003, Science Paper Online has published 64,971 original papers, covering all the 43 first-level disciplines in the Chinese academic system.<sup>28</sup> The discipline of electronics, communication, and auto-control is the most popular, with a total of 7,575 original papers in this area, followed by computer science (5,930) and management science (3,142).<sup>29</sup> According to the web traffic counter on the homepage, the platform had attracted 14.86 million visits by January 2013 and over 139,000 registered users.<sup>30</sup> Papers published on Science Paper Online can attract large readerships and some have succeeded in attracting even larger audiences than conventional Chinese journals.<sup>31</sup>

#### **Publish first, peer review later**

Anyone can submit academic papers to Science Paper Online, even amateur researchers. However, the original papers must pass through a preliminary editorial process before they are published online. The preliminary quality assessment examines the presentation of the paper, as well as the logic and methodology of the research. Science Paper Online's in-house editorial team decides whether to publish a submitted paper according to whether the paper is written in academic language, and whether it contains reasonable research methods, data analysis, and arguments. According to its executive director, almost 40% of the papers submitted are rejected in this round. In most cases, the results of the preliminary editorial assessment are provided to authors within seven working days and accepted papers are published simultaneously.

The authors can select between 'agree to peer review' and 'do not agree to peer review' when submitting papers, which does not affect the online dissemination of their papers. For those who select the 'agree' option, post-publication expert peer review will be provided. The post-publication peer-review system is designed to be as rigorous and authoritative

as traditional journal publishing, and normally involves two reviewers. This platform uses the Chinese Ministry of Education's expert database to invite senior scholars (normally of associate professor or higher level) to review papers for Science Paper Online. In the majority of cases these reviewers also review for traditional journals.

Expert peer-reviewers are required to assess original papers for their quality and value and to provide them with a ranking of between one and five stars. Reviewers remain anonymous to both authors and readers of papers published on Science Paper Online. However, in contrast to traditional journals, the feedback provided by expert peer-reviewers is made visible to both groups, adding an important element of transparency to the peer-review process. As post-publication peer review is carried out without pressure to filter content for publication, feedback tends to be more practical and encouraging than is the case in traditional journals, even when reviewers are pointing out errors or providing papers with a low mark.

In addition to expert peer review, Science Paper Online also employs a social peer-review model. Users can rank each paper between one and five stars, just as the expert reviewers do, in terms of three aspects: originality, scientific value, and authenticity, in addition to being able to provide direct comments. Users can also add a paper to their list of personal favourites if it is very useful and valuable. The total number of clicks, number of downloads, and number of times selected as a favourite by users is calculated and appears on the paper's front page, ensuring that the outcomes of social assessments are visible. When readers search for papers, they are able to sort results according to these indicators of usage in order to identify the papers most valued by other readers. Moreover, the users' comments and usage data can form an immediate comparison with the opinions of the expert reviewers.

Mark Patterson, the director of *PLoS One*, has argued that a new paradigm of publishing gatekeeping is emerging, 'whereby articles are subject only to technical assessment (by peer review) before publication, and impact assessment takes place during the post-publication phase'.<sup>32</sup> Science Paper Online has adopted this approach and taken it further. The combination of single blinded peer review with

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social peer review and crowd-sourced information on use employed by Science Paper Online provides a quality ranking system that is more transparent, objective, and democratic than either traditional double-blind peer review or the communication-focused model of *PLoS One*.

### Certification of papers

In order to encourage authors to submit papers and to ensure that they could be recognized for doing so within the established academic assessment system in China, the platform began issuing certificates for high-quality papers approved by expert reviewers in 2008.<sup>33</sup> According to Science Paper Online, the quality of three-star papers is considered equal to that of publications in mid-ranked Chinese scholarly journals, four-star papers are of a quality that would be expected in Core Journals,<sup>34</sup> and five-star papers equal those published in top journals. Based on such a marking system, Science Paper Online issues certificates for papers that have been ranked as three stars or above. These certificates can be used for academic evaluation, depending on the policies of an academic's institution.

When Science Paper Online began issuing these certificates, the concept of using an online platform to perform the certification function in academic publishing was a unique experiment. Creating publication certificates was part of a deliberate attempt to provide authors with a level of prestige within the Chinese academic system that is equivalent to the credit provided by traditional journal publishers and to create a mechanism for integrating informal literature with the processes of formal scholarly publishing.<sup>35</sup> The fact that Science Paper Online is operated by a major government department, the Ministry of Education, has given the platform a sense of authority and trustworthiness that has allowed it to establish itself as a legitimate publication channel for Chinese academics.

Another key innovation of Science Paper Online has been its capacity to provide researchers with an online platform on which knowledge priority can be established. Traditional journals in China combine protection for claims of knowledge priority with knowledge certification functions. In other

words, knowledge claims made within scientific communities are not recognized and cannot be effectively protected until they are peer reviewed and published. Ironically during the pre-publication process in China, work is sometimes stolen or rejected so that a reviewer can secure a competing interest. Online preprints operators often claim that sharing working papers on public websites is the best way to protect priority claims because evidence of the date of publication is clearly recorded and established. However, many academics feel that online preprints would not carry the requisite authority in intellectual property lawsuits in China. Because Science Paper Online exists under the umbrella of a formal government agency, it is able to function as a *de facto* registration system for knowledge priority for online papers. Science Paper Online issues formal proof of publication time. This function not only reduces the worries of authors regarding publishing preliminary research outputs online, but also provides authors with a mechanism through which priority can be registered before research is submitted to traditional journals. Because Science Paper Online makes no claims to ownership of the copyright in original papers published on its platform, authors remain free to publish papers later through other journals.

### Extended integration

In 2006 Science Paper Online began expanding from online publishing to offline print journals. Its monthly journal, *Science Paper Online Journal*, which focuses on four major STM disciplines, was first published in 2006<sup>36</sup> and has an impact factor of 0.929.<sup>37</sup> The *Science Paper Online Journal* is essentially similar to other traditional print journals, with the exception that papers must first have been published on the Science Paper Online platform. As with the two *PloS One* flagship journals *PLoS Biology* and *PLoS Medicine*, the managers of Science Paper Online aim to build a high impact factor core journal in order to improve the credibility and influence of the overall brand, and to ensure that the value of content and investment of scholars' time made in the online database are leveraged to maximum effect. Although the *Science Paper Online Journal* has been indexed and archived by

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*A variety of social media functions are also integrated based on scholars' personal space*

major Chinese databases such as Wanfang and CNKI, as well as some international repositories such as Cambridge Scientific Abstracts and the University of the Philippines Diliman Journals Online,<sup>38</sup> there is still long way to go before it can be upgraded to the status of core journal in China.

In 2008, using electronic publishing data issued by the Chinese Ministry of Press and Publishing,<sup>39</sup> Science Paper Online also began publishing a printed series of what they called 'outstanding online original papers' submitted to their platform since 2008, all of which had received a ranking of three stars or higher. Twenty-four issues are published every year and each issue focuses on one particular discipline.<sup>40</sup> Inclusion in this printed collection provides an added level of prestige for authors conscious of the requirements of university evaluation processes, and thus functions as a practical way of encouraging authors to submit original papers to the online platform. This is an interesting compromise with the existing academic evaluation system that values traditional publication formats for academic evaluation purposes.

As well as producing printed collections of content and publishing traditional journals, Science Paper Online is also continuing to expand its online functionality and reach. In addition to publishing original online papers, the platform is also integrating large numbers papers published in other journals through its open access journal database, which includes self-archiving by authors.<sup>41</sup> Moreover, Science Paper Online is trying to establish an online system of 'publication-based scholarly communication', harnessing Web 2.0 tools and driven by open access to data and content. In 2011, Science Paper Online placed a radial diagram on its web page of every original paper and every key word on its platform, which illustrated the connection between knowledge elements amongst papers and co-operative relationships among authors. This diagram was intended to help users identify their research peers through publications. A variety of social media functions are also integrated based on scholars' personal space whereby users can upload an academic CV, introduce others to their research interests, self-archive publications, use private instant messages, and join relevant groups.<sup>42</sup>

*the platform is fully sponsored by the Chinese government*

Unlike standard social media platforms, Science Paper Online encourages communication, interaction, and co-operation among users on its platform to be focused on research. It views social media functionality as a mechanism that supports scholarly communication, enabling authors to know each other through their publications, talk about papers, and to work together to improve the quality of their academic publications and research.<sup>43</sup> Science Paper Online's managers hope to promote collaborative science through the creation of an open academic publishing initiative, through which authors can not only share original research outputs, but also develop social networks and research collaborations based on active communication of scholarly publications.

#### **Competitive advantages and impact**

Science Paper Online's success and growing influence in a complex, rapidly changing market is a result of its combination of an innovative publishing model with traditional elements, and a very high level of government support. Based on its integrated model, Science Paper Online is providing a more open, efficient, and cost-saving alternative to existing journal publishing, and at the same time maintaining quality-certified features of academic publishing. The platform is able to facilitate the dissemination of the latest research and sometimes novel and challenging papers.<sup>44</sup> Because the platform is fully sponsored by the Chinese government, Science Paper Online is able to provide a completely free service to authors, as well as fully open-access content to readers.

Although Science Paper Online is not an immediate a threat to highly ranked journals, it has become a threat to the low-quality Chinese language journals that depend on page fees rather than subscription revenues. The Chinese academic system places a heavy emphasis on formal publications. This has created very high demand for publication certificates, which sometimes have no relationship with genuine academic publishing services. A lack of transparency and accountability within China's academic system have created a large market for vanity publishing services, which in some cases simply sell publication certificates

to academics who need them for evaluation. The transitional nature of China's publishing system has allowed a limited number of government-registered publishers to establish and defend a profitable monopoly in this space.<sup>45</sup> The existence of monopolies on the ability to operate journals also means that demand for publication certificates vastly outstrips genuine opportunities to publish. Science Paper Online's ability to provide peer-review services and publication certificates to academics free of charge, and to publish an unlimited number of papers on its platform, is addressing corruption within the established system by providing academics with a practical and affordable alternative.

An important element behind the Chinese Ministry of Education's decision to support Science Paper Online is its desire to ensure that Chinese outlets are able to compete with highly regarded international journals for the right to publish the best Chinese research. At present, China's most competitive academics are competing vigorously to publish their work in SCI-ranked journals, usually in English. As a result, Chinese readers have to wait for at least a year to read the work of their own research community. Not only that, but Chinese universities have no choice but to buy research outputs funded by the Chinese government back from international publishers. In response to this trend, the Chinese Ministry of Education requires funded research preprints to be made available via the Science Paper Online repository, to ensure that 'the fruits of Chinese academia serve China first'. This ethos is similar to the 'public access to publicly funded research' mantra driving open access mandates in other markets and has added to the competitive advantage enjoyed by Science Paper Online.

Government-supported open publishing models have the potential to impact on the established academic publishing system by reshaping the relationship between communication and certification in scholarly communication. Traditional academic publishing employs pre-publication gatekeeping, as a result of which being published not only means the wide distribution of scholarship, but also social approval of research by peer review and the registration of knowledge priority formally. This is by nature a certification-oriented sys-

tem and thus has its structural problems. Initiatives such as arXiv and *PloS One* are trying to reorganize the old system by establishing a communication-based alternative, which emphasizes fast and open dissemination of knowledge and reduces or removes unnecessary pre-publication gatekeeping. Science Paper Online has succeeded in creating a balance between light peer review and the use of post-publication assessment and between open academic publishing and traditional print publication to ensure that papers published in this new way are considered acceptable within established academic evaluation frameworks. The Chinese Ministry of Education is using innovative open access publishing models as a powerful mechanism for addressing corruption and inefficiency in the established academic publishing system and to ensure that the value of investments in research are maximized for Chinese research communities.

## Conclusions

In spite of the success of Science Paper Online to date, and the clear potential of this type of initiative to improve the scholarly communication system in China, the platform continues to face important challenges. Many established academics in China continue to favour traditional modes of scholarly communication and are paying little attention to emerging digital alternatives. Conservative attitudes to born-digital content and open publishing initiatives persist, particularly in terms of the trustworthiness of quality and its acceptability for evaluation purposes. Science Paper Online is doing its best to address these challenges by formalizing many aspects of its publishing system and using its status as a government-backed initiative to ensure that top scholars are included on its advisory board and act as reviewers.<sup>46</sup> In spite these attempts to build 'symbolic capital', only 37 Chinese universities have, to date, been willing to accept the official certificates issued by Science Paper Online for evaluation. Most of these institutions will only accept Science Paper Online publication certificates at a postgraduate level and very few top-ranked Chinese universities recognize Science Paper Online as a legitimate publication outlet.<sup>47</sup>

Another challenge for Science Paper

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Online relates to its status as a wholly government-funded initiative. Whether this model is sustainable, or desirable, in the longer term remains open to debate. In the context of a transitional academic publishing system in which established publishers lack either the capacity or willingness to experiment with open access approaches, Science Paper Online is playing an important role in the shift towards more open and collaborative academic publishing models. The capacity of Science Paper Online to provide entirely free services to Chinese academics has been vital to its ability to compete with established publishers and to attract submissions. In the longer term, it may be useful for Science Paper Online to shift to a more independent 'social enterprise' model in order to achieve financial sustainability and independence.

Science Paper Online provides an interesting example of a major government-driven push towards open access publishing and more collaborative approaches to knowledge certification and production. However, the challenges that it continues to face highlight the limits of such an approach in transforming the academic cultures and social norms that govern scholarly communication. Nonetheless, Science Paper Online provides a snapshot of the transformation of academic publishing towards an open, networked, and collaborative future in China, in particular, operated by non-publisher stakeholders and outside traditional academic publishing system. It helps to understand the dynamics and constraints associated with digital initiatives in the world's fastest growing academic publishing market and provides important insight into strategies that might be considered by publishers in other markets.

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20. According to the official transcription of the lecture by Mr Zhou Weihua in 'The Light of Blue Ocean – The Age of Capitals and Digital Reform' conference, see <http://124.42.89.42/xinwenzixun/chuban/2011-01-26/498.html>
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28. According to the up-to-date statistics on the home page, see <http://www.paper.edu.cn/> (accessed 19 January 2013).
29. *Ibid.*
30. This is the latest official figure, from 2006: [http://www.paper.edu.cn/index.php/default/info/info\\_detail/2839](http://www.paper.edu.cn/index.php/default/info/info_detail/2839)
31. For example, the most popular paper in the most popular discipline has received 7,414 clicks and 8,481 download times, see <http://www.paper.edu.cn/index.php/default/releasepaper/content/200404-68> (accessed 16 May 2011); in some small disciplines such as library studies, the most popular one has attracted 2,717 clicks and 1,184 download times, see <http://www.paper.edu.cn/index.php/default/releasepaper/content/200701-233> (accessed 16 May 2011).
32. See <http://river-valley.tv/plos-innovations-in-peer-review/>
33. [http://www.paper.edu.cn/index.php/default/info/info\\_detail/2130/](http://www.paper.edu.cn/index.php/default/info/info_detail/2130/)
34. According to a report by Wuhan University, there are 1,324 'core' journals in China, accounting for 21.46% of total academic journals, which are regarded as high-quality and impact journals and highly valued by academic evaluation; 311 of these 'core journals' enjoy the further distinction of being classed as 'authority journals': see <http://edu.163.com/09/0817/08/5GTHU3CJ0029314V.html>
35. According to the author's interview with Dr Li, the founder and director of Science Paper Online.
36. These are (1) electrics, communication and auto-control technology, (2) computer and information science, (3) chemistry, and (4) civil and architectural engineering, and transportation engineering.
37. [http://www.paper.edu.cn/index.php/default/info/info\\_detail/3196/](http://www.paper.edu.cn/index.php/default/info/info_detail/3196/)
38. <http://journal.paper.edu.cn/>
39. The Chinese government controls the overall scale of academic publishing by restricting journal numbers. Despite huge demands of academic publications, the new journal numbers have been highly limited, which function as license to launch new journals. In this case, Science Paper Online has to use an electronic publishing number to publish print collections of online papers, which is easier to apply but normally for electronic publications only such as CD, DVD, etc.
40. [http://www.paper.edu.cn/index.php/default/info/info\\_detail/3128/](http://www.paper.edu.cn/index.php/default/info/info_detail/3128/)
41. The platform invites famous scholars to self-archive important publications, which greatly improves the overall quality of open access repository; meanwhile, regular academics can also self-archive their publications, which are categorized separately as 'self-recommended scholars'. So far the scholars' self-archiving platform has attracted 75 members of the Chinese Academies of Science and Engineering, 304 top scholars in Chinese National High-tech R&D Programs 873 and 863 (see [http://www.most.gov.cn/eng/programmes1/200610/r20061009\\_36225.htm](http://www.most.gov.cn/eng/programmes1/200610/r20061009_36225.htm)), and 118 Changjiang scholars and in total over 100,000 high-quality publications. Meanwhile, Science Paper Online is also an integrated database for open access journals in China. Its open access repository has attracted over 400 Chinese journals that signed an open access agreement and has collected 452,503 journal papers: see [http://www.paper.edu.cn/index.php/default/info/info\\_detail/3116](http://www.paper.edu.cn/index.php/default/info/info_detail/3116) (accessed 4 July 2011); <http://www.paper.edu.cn> (accessed 5 May 2011).
42. In early 2011, the scientific group functions were added: see [http://www.paper.edu.cn/index.php/default/info/info\\_detail/3387/](http://www.paper.edu.cn/index.php/default/info/info_detail/3387/)
43. According to interviews with its founder and executive director by author.
44. According to an interview with the author.
45. See <http://scholarlykitchen.sspnet.org/2011/04/07/paying-for-impact-does-the-chinese-model-make-sense/>; and <http://www.universityworldnews.com/article.php?story=20110227085921588>
46. Science Paper Online has invited top academics in each discipline to form an expert consultancy committee to guide its academic publishing practices. Currently this committee consists of 35 CAS (Chinese Academy of Science) or CAE (Chinese Academy of Engineering) members.
47. <http://www.paper.edu.cn/index.php/default/heightschool/>

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