Knowledge, Science, and Society Seminar

一个理解知识，科学，与社会的“无形学院”

科学是如何产生的？一门学科是这样产生的: 首先，需要有人提出大问题。这些问题能够让人们脱离日常的、高度情境化的生活，因而比其他琐屑具体的问题更能吸引新一代的年轻学者，这些年轻人追求智力生活——与现有学者建立联系，一起回答重大问题，而不满足于平庸的日常生活。其次，需要让“共识对话”继续下去。在一个充满了“冷知识”的世界里——从未被引用的论文，大多数人几乎闻所未闻的书籍，几乎不会被重复使用的代码——只有活跃的对话和思想碰撞才能创造“热知识”，并将年轻一代学者引向那些真正重要的主题。通过这些旨在产生共识的对话（虽然对话本身可以是激烈的辩论），年轻学者才能找到科学前沿，他们创造的新思想和发现才能引入“主流”科学的核心，改变科学的未来版图，而不是把创造力浪费在重复发明轮子上。

追求大问题和促成共识对话，这两个原则适用于所有科学分支，无论学者是否承认或应用它们。这也是为什么人类智力史上最伟大的科学家或者最重要科学发现，往往背后都有一个“无形学院”（ invisible college）。例如在欧洲16-17世纪科学大革命（Scientific Revolution) 时产生的，孕育了波义耳和他的“燃素说”，成为英国皇家学会前身的哈特利布学派 (Hartlib Circle, 1630-1660），欧洲20世纪产生的，培养了哥德尔，催化了他的“不完备定理” 的维也纳学派（Vienna Circle， 1924-1936），二战后学术中心向美国转移时聚集了爱因斯坦，冯诺依曼等人的普林斯顿高等研究院（Institute of Advanced Studies) , 以及一直到现在还在活跃的芝加哥大学的“思想委员会”（The John U. Nef Committee on Social Thought）。事实上，伟大的科研想法往往来自智力网络中与单个学者的结合—智力网络能比单个人更具有“广度”，可以覆盖时代前沿和传承历史遗产来筛选重要问题，但最后在深入钻研这些科研想法的时候，又必须是单个人的。因为单个人和小团队比大团队在思想空间中“移动”得更快，更容易取得单个问题上的“深度”突破。科学哲学家Randal Collins还指出过另一个重要方面—只有那些拥有智力网络的单个学者，才能获得足够的文化资本（cultural capital）来定位重大问题以及充分的情感能量 (emotional charge)来解决它们。

学术共同体对于“跨学科领域”同样重要，然而这一点不是那么直观，因为许多人可能认为跨学科的优势在于不需要形成共识。但一个没有共识的领域是无法在科学史上有一席之地的，也无法继续吸引一代又一代的年轻人。跨学科领域原本就比传统领域在共识方面更很脆弱，因此更容易在时间中消散——它们更像是各派学者们在沙漠旅途中驻足的绿洲，而不是居民可以长期居住并且创造跨代辉煌文明的城市。元知识（meta knowledge）、科学学 (the Science of Science)、或者关于知识的知识 (the Knowledge of Knowledge)---- 它关心知识被创造、遗忘和重新发现的社会过程---- 就是这样一个跨学科领域。就像许多其他跨学科领域一样，它严重受限于脆弱的共识：例如什么样的研究问题是重要问题，什么不是？哪些理论可以被定量地测量和检验，它的政策后果又是什么？不同学科的人会有非常不同的回答。我们鼓励学科多样性，但认为这应该是我们追求共识的动力，而不是放弃共识的借口。

在这种背景下，我们希望可以形成一个“无形学院”，创造一个“关于知识的知识”(the knowledge of knowledge) 的社区，通过核心学者的相互联系来优化配置人才（talent），想法（ideas），和科研资源（resources），实现小而美的社区增长。我们将共同寻找和探求关于知识的基本理论，分享我们不同的专业技能，包括理解科学知识生产的社会过程 (社会学)，寻找

科学技术的进步指标(信息科学)，探索科学知识生产的普遍规律(物理学)，以及理解机器智能如何加速人类知识的增长 (计算机科学)。我们希望将应用(“如何”) 与理论 (“为什么”) 联系起来，去理解我们已经测量的东西（例如什么是影响力因子？哪些因素可以提升它？哪些因素看似有关其实影响不大？），去测量我们尚未理解的东西（被看作“常识”的知识，例如牛顿定律，它的影响力无法通过论文引用体现。哪些知识属于此类知识？人类是如何传承这种知识的？科技创新又有多大程度依赖这些知识？），去通过建设性的辩论形成动态共识，最终将我们的科学想象力从被行政和日常事务充满的体制内科学职业中解放出来，更好地指导下一代学者，提升他们的科学创造力和影响力。

成员(暂定)

戴良灏，浙江大学，社会学系
刘知远，清华大学，计算机系
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步一，北京大学，信息管理系
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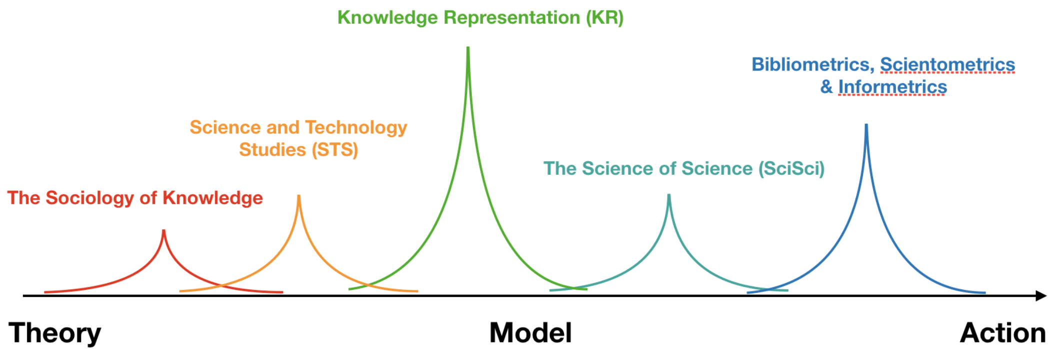
我们可以一起做的事

科研职业的成功，依赖于大量“隐性知识”（tacit knowledge）。这些知识只能通过长期的实际科研活动在经验中获取，或者通过人际互动缓慢地传播。不同学科之间在期刊偏好等方面的不同，导致跨学科的学者要成功尤为困难。特别是当前学科发展日新月异，科学前沿几乎每天都在被更新，依靠单个学者的经验积累和知识搜索范围，已经越来越难跟上变化。一个无形学院的存在，可以帮助我们理解研究文化的学科差异及其成因。为什么物理学喜欢追求普遍规律，计算机喜欢建模，而社会学喜欢研究具体情况（context）？什么是好的计算社会科学研究？人文学者，自然科学和社会科学学者，和计算机科学家分别以什么衡量成就？书？期刊？经费和系统规模？物理学家和社会学家都谈论complexity，他们说的一样吗？它还有以下几个功能：

1. **追踪科学前沿，寻找科研机会**

（1）理解不同科学期刊和会议的发表标准。PNAS, Nature Communication, Nature Human Behavior等综合类科学期刊与Management Science等管理学，经济学期刊偏好有何不同？ 同样与科学政策有关，Research Policy, Journal of Informetrics，Scientometrics哪个质量更高？Sociological Science 与Social Studies of Science 比较有何特点？KDD, EMNLP, CSCW, CHI...哪个计算机会议质量比较高，组成人员有何不同？IC2S2与NetSci都是计算社会科学的会，它们有什么区别？有哪些值得关注的NBER经济学家在研究知识生产？

（2）追踪国际学术动态： 学术社区内部的辩论和争议，往往是吸引关注的方法，对学科的发展未必是不利的，但它也真实地反应着学术社区平静的水面下潜在的“暗礁”与分歧。特别是对于年轻学者，如果对于动态变化的学术环境缺乏认识，容易被卷入超越科学本身的分歧和辩论，消耗大量自身精力，甚至面临重大职业危机。2020年3月，科学计量学领军人物，ISSI现任主席Cassidy Sugimoto对Dashun Wang和Barabasi合著的Science of Science一书的书评“Scientific success by numbers” 如何理解？Bedoor, Talal等人2019发表在Nature Communication上对于师生合作的论文被撤稿反应了什么？



图一. 不同领域，虽然都关注knowledge这个主题，但在从理论到应用的光谱上，往往比较侧重其中一个环节。

2. **科研交流： 为彼此学生的研究提供"免费"辅导反馈。持续讨论如何建议合理有效的机制来推进具体研究项目上的合作。以线上讨论为主。**

3. **科研休假（retreat）：可以单独组织闭门讨论，也可以利用大家都感兴趣的学术会议，例如STS或者ISSI，来形成大会的workshop 或者组织期刊的special issue。**

8月23-24线上会议议程（原定清华，因疫情改为线上）

Vision & Faculty Introduction | 北京23日8-11AM | 美东22日8-11PM

Opening (8:00-8:10 by Lianghao)
1) 8:10 – 8:30 yongren shi. Voluntary associations in knowledge economies.
2) 8:30 – 8:50 Lianghao Dai，representation of minds; minimum degree of knowledge sharing for establishing an interdisciplinary collaboration; research interdependence.
3) 8:50 – 9:10 Lingfei Wu

Title: What is scientific knowledge and how is it created, accumulated, and transformed collectively?

Abstract: Science is built upon scholarly consensus. This does not deny the possibility that we can approach truth but reminds us that we always rely on certain social mechanisms to approach it. The legitimacy of scientific knowledge is challenged by Bruno Latour, who thoroughly examined how scientific facts are produced by scientists in labs and elsewhere, using figures and other inscriptions. The coverage of scientific knowledge is questioned by Michaele Polanyi, a pioneer in identifying the "dark matter" of the knowledge universe—the personal, tacit, and unspoken knowledge upon which the scientific consensus is built. Randall Collins examined the emergence and evolution of consensus over the two-thousand-year history of intellectual change, with a special focus on the Scientific Revolution in 16-17 century Europe. Why, he asked, was it at this period when "hard science" (natural science) shifted into a fast track characterized by high consensus and rapid discovery, whereas "soft science" (humanity and social science) appeared to be left behind? Denying the difference between these two sectors of knowledge in interest in empirical work, training from scientific epistemology, and complexity of research topics, Collins proposed that research technology was the key to make a science ”take off”. A modern version of this idea is ”machinery science”, that scholarly consensus is produced by research technology maturity and upgrading at large—telescopes to astronomy in the 16-17 century, SPSS to sociology in the 1970s, and neural networks to artificial intelligence in our time. These research tools produce many new facts, lower the bar of training new scientists, and most importantly, force all scientists in the field to rapidly form consensuses on old topics so they can move forward to the new frontiers.

To me, the theories of Latour, Polanyi, Collins, and many others do not deconstruct the value of scientific knowledge, but rather highlighting it by presenting the complex, expensive social process in which new ideas are proposed, ignored, and eventually recognized, and therefore, provide a foundation to prevision the future of science from our time. How will science advance in a world of ”big science,” characterized by hierarchical scientific enterprises, pervasive communication technologies, and smart machines? Will ideas get harder to find for individual scholars, so we should count on large research teams dividing labors and using expensive devices for scientific discovery? Or alternatively, heroic, lonely geniuses like Newton and Einstein will still do their magic for the rest of us, creating scientific miracles in the years to come? Why top scholars snd universities still be so concentrated in places despite the wide use of communication technologies? Can remote teams innovate as much as local teams? How would the demography of the research workforce shape teams and drive science advances, will China gain advantages in national innovation over the U.S. by having more young scientists and teams? And if yes, would China’s research strength exemplifies more on ”hard science” than ”soft sciences,” as the former depends more on research technologies to innovate, on which experience is less an advantage than a burden? My past and ongoing work aim to respond to these pressing questions on science in our time, with a general interest in understanding how society thinks and what society knows.

4) 9:10 – 9:30 Jiang Li, The influence of scientists’ mobility on science.

Break 9:30 – 9:40

5) 9:40 – 10:00 Yi Bu, A discipline scheme-free interdisciplinarity measurement; A multidimensional framework for characterizing the citation impact of publications.
6) 10:00 – 10:20 An Zeng, The representative works of scientists.
7) 10:20 – 11:00 Open discussion
How could an ”invisible college” complement our institutional academic life?
  i. How do we identify important research questions on knowledge production across fields, including biometrics, sociology of science, S&T innovation, complex networks, knowledge representation?
  ii. How do we expand research vision over the broader literature landscapes across fields?
  iii. How do we motivate (e.g., accelerate research progress) and support next-generation scholars (e.g., recommendation letters for the job market?)

Student Presentation A | 北京23日8-11PM | 美东23日8-11AM

1) 8:00 – 8:45 Jiawei Xu (Yi Bu) Patterns of knowledge integration and diffusion for interdisciplinary scientific publications
2) 8:45 – 9:30 Yanmeng Xing (An Zeng) survival and success of junior researcher
3) 9:30 – 10:15 Huiming Chen, Country Image in COVID-19 Pandemic: A Case Study of China
Break
4) After 10:30 Open Discussion

Student Presentation B | 北京24日8-11AM | 美东23日8-11PM
1) 8:00 – 8:45 Yiling Lin (Lingfei Wu) Can remote teams innovate?
2) 8:45 – 9:30 Zhenyue Zhao (Jiang Li) Knowledge accumulation through citations
3) 9:30 – 10:15 Zejian Lv (Lianghao Dai) How subfields emerge?
Break
4) 10:40 – 11:00 Open Discussion

Next time? If yes, where and when

附件一：核心问题 （每个人1-5个最想研究的问题）

戴良灏，浙江大学，社会学系
1. 科学和资本的关系，以及如何摆脱资本主义和异化
2. 科学可以帮我们认识世界的本质吗？如果不能，科学在干嘛？
3. 科学里的山头现象
4. 如何组织科学团队才不会有悖科学的原则，且又能推动科学的前进

李江，南京大学，信息管理学院
1.学科交叉促进知识创新的机制是什么？
2.真实世界的科学知识流动并不是『引用』所揭示的那样，未被观测到的知识流动（例如默会知识）对科学进步有多大贡献？

刘知远，清华大学，计算机系

步一，北京大学，信息管理系
1. 如何让“导师-学生”制的合作模式更好地发挥作用，以推动科学的前进？
2. 如何训练研究人员（科学家）以更好地进行跨学科创新？
3. 文化如何影响科学创新？

曾安，北京师范大学，系统科学系
1. 如何将科学学中的相关性分析拓展到因果分析？例如，小团队创新，到底是因为团队小而创新性强，还是因为有创新性想法而组织小团队？这个很重要，因为只是相关性分析无法给出政策建议，无法指导科学家们该如何做。
2. 科学研究中的宏观现象的微观底层机制是什么？例如宏观上领域的涌现和学科的分支，在微观上科学家行为层面上该如何建模。

施永仁，爱荷华大学，社会学系
文化，观点，态度等如何在特定社会系统中成型，扩散和消亡？特别对互联网社区中的极端亚文化社区的演化有兴趣。我的研究兴趣不在于科学的科学，而在广义上的知识，包括人接触和内在

化的社会知识，的动态和结构。

吴令飞，匹兹堡大学，计算机与信息学院

1. 科技研发团队日趋变大，劳动分工也越来越细，这会促进还是阻碍科技创新?
2. 科学团队和社区的人口和权力结构会影响科学进步速度吗？中国比美国拥有更多年轻科学家，会带来更多进步吗?
3. 不同学科发展的阶段，前进的方式和速度一样吗？“硬科学”和“软科学”有何不同?
4. 远程协助的模式正在被越来越多的机构采用，它会激发还是阻碍创造力?
5. 公司要招聘什么样的人才可以促进产品创新?

附件二：英文倡议书

Pursuing Foundational Questions in the Knowledge of Knowledge

How to make a science? A science is created as follows: first, one needs to ask *big questions*. These questions are supposed to lift people from the routine, highly contextual life, so they beat other questions in attracting the new generation of souls and talent that seeks emotional satisfaction in a transcendent way—by engaging in conversions with existing scholars in responding to big questions. Second, one needs to *keep the party going*. In a universe where "cold" knowledge—papers that are never cited, books that are hardly heard of, and code that are barely reused expand explosively, only ongoing conversations can keep the souls passionate about making "hot" knowledge and direct talent to the topics where their potential effectively translates into academic career success. These conversations bond scholars gathering under big questions, form scientific frontiers and reproduce creativity, which is not only about breeding new ideas but also involves introducing them to the central body of the "mainstream" science.

These two principles hold for all branches of sciences, with or without the scholars recognizing or applying them. But less intuitively, they are particularly important to “interdisciplinary fields,” for these fields are fragile in consensus and thus vulnerable against time—they are more like oases in which scholars from all walks of life take a rest before departure than settlements that host its residents grow glorious civilizations across generations. The study of meta knowledge, or the knowledge about knowledge—how knowledge is created, forgotten, and reinvented, has been chained by these limitations, like many other interdisciplinary fields.

Against this background, we are interested in gathering as an “invisible school” for synergistic activities. Together, we will recruit and pursuit fundamental questions about the knowledge of knowledge, share and mingle our diverse expertise, including understanding the social mechanism of knowledge production (sociology), evaluating advances in science and technology (information science), quantifying universal patterns in knowledge creation (physics), modeling scientific discourse (computer science). We aim to link applications (“how to”) to theories (“why”), to understand what we have measured and to measure what we don't understand yet, to form dynamic consensus through constructive disagreements and inspiring debates, to unchained our imaginations from the highly constrained scientific profession, and to mentor, serve, and lift the next generation of scholars, so the science we believe advance one generation a time towards the foundational questions.

Core Members (tentative)

Lianghao Dai, Department of Sociology, Zhejiang University
Jiang Li, School of Information Management, Nanjing University
Zhiyuan Liu, Department of Computer Science, Tsinghua university
Yi Bu, School of Information Management, Peking university
An Zeng, School of System Sciences, Beijing Normal University
Yongren Shi, Department of Sociology and Criminology, University of Iowa
Lingfei Wu，School of Computing and Information, University of Pittsburgh