Premonitions of Privatization: Intellectual Property, Technology Transfer, and the Haunting of Public Science

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While the expansion of intellectual property legalities over the past forty years has had many material effects in the form of creating enclosures and redistributing resources, there are places where the ephemeral presence of intellectual property has shaped perceptions and practices in an outsized way. One area where this can be clearly witnessed is in academic and public sector science, where beginning in the 1980s and 90s, universities and government agencies in many parts of the world increasingly applied proprietary and capitalist logics to their research products. These logics manifested in novel vocabularies and institutional structures dedicated to "technology transfer", "commercialization",[1] and "public-private partnership",[2] and encouraged researchers in scientific and technical fields to behave like entrepreneurs[3] by ensuring that research results are commodifiable and able to be distributed through globalized economic value chains. Intellectual property is central to this transformation from science as a method of knowledge generation to science as a means of capital accumulation, both because of the tradeable "goods" that patent, copyright, and other legal frameworks instantiate, and because of how its spectral presence shapes contemporary techno-scientific and capitalistic imaginaries.

Today, organizations across the world enable intellectual property to cast a long shadow over scientific research. Examples include the Association for University Technology Managers (AUTM),[4] the Association of European Science and Technology Transfer Professionals,[5] and Knowledge Commercialisation Australasia.[6] These groups encourage researchers to obtain rights to their inventions under patent and other proprietary regimes, and to use legal tools such as contracts to transfer these rights to private enterprises.[7] The assumption is that, because many new technologies require substantial refinement and

[1] Rasmussen, E., Moen, Ø., & Gulbrandsen, M. (2006). Initiatives to promote commercialization of university knowledge. *Technovation*, *26*(4), 518-533.
[2] Meissner, D. (2019). Public-private partnership models for science, technology, and innovation cooperation. *Journal of the Knowledge Economy*, *10*(4), 1341-1361.
[3] Jain, S., George, G., & Maltarich, M. (2009). Academics or entrepreneurs? Investigating role identity modification of university scientists involved in commercialization activity. *Research policy*, *38*(6), 922-935.
[4] Association for University Technology Managers, *available at* https://autm.net/.
[5] Association of European Science and Technology Transfer Professionals, *available at* https://www.astp4kt.eu/.
[6] Knowledge Commercialisation Australasia, *available at* https://techtransfer.org.au/.
[7] Hayter, C. S., & Rooksby, J. H. (2020). Policy advocacy and organizational change at the Association of University Technology Managers (AUTM). In *Research Handbook on Intellectual Property and Technology Transfer* (pp. 131-142). Edward Elgar Publishing.

regulatory stewardship, not-for-profit research institutions do not have the capacity to develop and distribute their inventions to broad publics. Instead, the commercial exclusivity gained under intellectual property laws and the profit incentives inherent to business should be leveraged to maximize the social impact of new technologies.[8]

The belief that public to private transfers of knowledge and technologies will result in broadly shared benefits belies the fact that most of the inventions generated in the public and academic sectors do not actually result in commercial products. Even in the United States, arguably the country where linkages between the academy and industry are most pervasive, a relatively small number of university technologies are brought to market. According to AUTM, in 2020 there were 27,112 inventions reported in US universities.[9] These institutions filed a total of 17,738 new patent applications that year and entered into 10,050 intellectual property licensing deals.[10] However, the number of new products that were developed based on these kinds of technology transfer activities was only 933 in 2020.[11] In other words, each year, approximately 3% of inventions created in US universities will be converted into market goods.

Notwithstanding the low rate of the translation of scientific outputs into commercial products, since the 1980s a massive infrastructure has been built to support intellectual property claims-making by researchers. Today, many science and engineering focused universities, not only in North America but throughout the world, are home to units designated as "technology transfer", "commercialization", or "industry liaison" offices.[12] The largest of these units employ more than 150 people, who often have highly specialized training in technical fields, law, or business.[13] In addition to ensuring that their own staff have the requisite knowledge about the inventions they manage, relevant intellectual property laws, and sector-specific business practices, technology transfer offices play a significant role in fostering institutional cultures of "academic entrepreneurship", which involves "instilling an entrepreneurial mindset in students, faculty, and researchers."[14] These efforts have resulted in new pressures that PhD

[8] See, e.g., National Research Council. (2011). *Managing University Intellectual Property in the Public Interest*. Washington, DC: National Academies Press.
[9] AUTM 2020 Licensing Activity Survey, *available at* https://autm.net/AUTM/media/SurveyReportsPDF/FY20-US-Licensing-Survey-FNL.pdf.
[10] *Ibid.*
[11] *Ibid*.
[12] See, Brescia, F., Colombo, G., & Landoni, P. (2016). Organizational structures of Knowledge Transfer Offices: an analysis of the world's top-ranked universities. *The Journal of Technology Transfer*, *41*(1), 132-151 (exploring the technology transfer models of universities located in 24 countries).
[13] Baglieri, D., Baldi, F., & Tucci, C. L. (2018). University technology transfer office business models: One size does not fit all. *Technovation*, *76*, 51-63.
[14] Fasi, M. A. (2022) An overview on patenting trends and technology commercialization practices in the university Technology Transfer Offices in USA and China. *World Patent Information*, *68*, doi:10.1016/j.wpi.2022.102097.

students and faculty in science and engineering disciplines now feel to participate in commercialization activities, including to claim their research outputs as intellectual property.[15]

The kinds of expectations that the specter of intellectual property produces for researchers is not confined to the university sector. Instead, similar dynamics are visible across a range of public and private not-for-profit institutions, including those which are based in parts of the world where intellectual property claims-making has historically been scarce. A prominent example of how proprietary hauntings have shaped institutional practice in public sector science is found in the Consultative Group on International Agricultural Research (CGIAR). This organization is the largest network of agricultural research centers in the world, comprising 15 institutions based in 15 countries, which collectively employ over 9,000 scientists, researchers, and other staff.

The original CGIAR mission was to promote food security in developing countries through sustainable agriculture.[16] This was accomplished by distributing agricultural research products directly to target beneficiaries free of any cost.[17] Today, however, a reformulated CGIAR mission reflects a more entrepreneurial vision. The organization now aims to "deliver science and innovation that advance the transformation of food, land, and water systems in a climate crisis."[18] The words "deliver" and "innovation" are key here, when considered in the context of policy changes that CGIAR has undertaken over the past decade. Once understood as "global public goods",[19] all CGIAR research products are now conceived as "intellectual assets", whether or not they are formally protected under intellectual property laws.[20]

The shift in the CGIAR mission may be traced to the early 1990s, when intellectual property became a widespread matter of concern for CGIAR scientists and administrators, who

[15] Duval-Couetil, N., Ladisch, M., & Yi, S. (2021). Addressing academic researcher priorities through science and technology entrepreneurship education. *The Journal of Technology Transfer*, *46*(2), 288-318.
[16] CGIAR. "Research Centers". *Available at* https://www.cgiar.org/research/research-centers/.
[17] Byerlee, D., & Dubin, H. J. (2009). Crop improvement in the CGIAR as a global success story of open access and international collaboration. *International Journal of the Commons*, *4*(1).
[18] CGIAR. "Strategy". *Available at* https://www.cgiar.org/how-we-work/strategy/.
[19] In the CGIAR context, global public goods (now officially termed "international public goods") are products of scientific research whose social returns on investment exceed any potential private returns. In theory, global public goods are freely available to all (non-excludable) and not diminished by use (non-rivalrous). However, according to the current CGIAR conceptualization, intellectual property may be justified to render certain technologies not freely available to all (excludable), where doing so increases value for society as a whole. See Dalrymple, D. G. (2008). International Agricultural Research as a Global Public Good: Concepts, the Global Experience, and Policy Issues. *Journal of International Development*, *20*, 347-379: 350-351.
[20] *CGIAR Principles on the Management of Intellectual Assets*. (7 March 2012). p. 2, FN 2. *Available at* https://storage.googleapis.com/cgiarorg/2018/03/CGIAR-IA-Principles.pdf.

worried about the proliferation of "proprietary science".[21] This concept recognized that due to technical and legal changes that occurred in the 1980s, agricultural technologies such as plant genetic components and whole varieties were increasingly being claimed under patent and plant variety protection regimes as means to ensure market exclusivity by private agribusiness.[22] Since that time, the perceived need to respond to the expansion of intellectual property and to develop partnerships with the private sector has led to the alteration of many CGIAR activities, but not necessarily in the way that many experts initially expected.

While opponents of privatization and commercialization feared that the pursuit of patents and plant variety protection by CGIAR scientists would undermine the network's mission, proponents foresaw the potential of intellectual property to incentivize partnerships with agribusiness, which among other benefits could provide a revenue stream that would at least in part replace steadily diminishing governmental funding.[23] Ultimately, the possibility that centers might obtain intellectual property for their creations has not substantially altered their research agendas, nor has it led to a dramatic increase in formal proprietary claims for CGIAR technologies.[24]

Instead, informal, quasi-property legal mechanisms have proven more generative than patents or plant variety protection in fostering partnerships between CGIAR and private entities. For instance, between 2018 and 2020, an average of 65 "limited exclusivity agreements"[25] were executed each year between CGIAR and third parties.[26] During the same

[21] This worry was so pronounced that in 1997, the CGIAR Chairman formed an expert Panel on Proprietary Science and Technology, whose purpose was to determine how CGIAR should best navigate relationships with the private sector. CGIAR. (1998). *Report of the CGIAR Panel on Proprietary Science and Technology*. Document No.: SDR/TAC:IAR/98/7.1, <http://www.fao.org/3/w8425e/w8425e00.htm> (last visited 30 August 2021).

[22] *Biotechnology in the International Agricultural Research Centers of the Consultative Group on International Agricultural Research: A Statement by Center Directors*. CGIAR Mid-Term Meeting, the Hague, the Netherlands, 21-25 May, 1990. p.5 (demonstrating how by 1990, all CGIAR center directors "accepted that the legal protection of inventions and intellectual property" had become stand practice in modern agricultural science.).

[23] Spielman, D. J., Hartwich, F., & von Grebmer, K. (2007). *Sharing science, building bridges, and enhancing impact: public–private partnerships in the CGIAR* (No. 589-2016-39805).

[24] From 2012 to 2019, only 43 patent claims and 5 plant variety protection claims were lodged across all 15 CGIAR Centers. Data compiled from the annual Intellectual Assets Reports for 2012-2019, available at CGIAR, 'Intellectual Assets Reports', <https://www.cgiar.org/food-security-impact/intellectual-assets-reports/> (last visited 9 July 2022).

[25] Limited exclusivity agreements are contracts through which CGIAR entities may grant limited exclusivity for the commercialization of their intellectual assets where exclusivity is necessary for further improvement of intellectual assets or to enhance the scale or scope of impact on target beneficiaries, in furtherance of the CGIAR Vision. *CGIAR Principles on the Management of Intellectual Assets*. (7 March 2012) Principle 6.2.

[26] Cummings, S., J. Koerner, M. Schut, R. Lubberink, T. Minh, D. Spielman, J. Vos, M. Kropff (ed.) and C. Leeuwis (ed.) 2022. Open for Business: Pathways to strengthen CGIAR's responsible engagement with the private sector. CGIAR Special Report published in collaboration with the NL-CGIAR Strategic Partnership. April 2022. p. 32.

period, the mean number of patent applications that CGIAR filed was only 3, with an average of 2 plant variety protection claims lodged each year.[27]

These figures demonstrate that the presence of intellectual property within CGIAR has been more spectral than substantial, a phenomenon that produces subtle and diffuse effects on the activities of individual centers, and on how they relate to one another and to third parties. Even centers that have never applied for a patent or plant variety protection have adopted institutional policies to deal with intellectual property and technology transfer, and have hired specialized administrative staff with expertise in these areas.[28] These shifts demonstrate that the specter of intellectual property has contributed to material changes across CGIAR while shaping a network culture that over the past 40 years has increasingly internalized a global capitalist approach to agricultural science.

At both CGIAR and beyond, the logic, rhetoric, and practices of public to private knowledge and technology transfers demonstrate that intellectual property is much more than a series of defined legal categories. Instead, in the context of many scientific and technical fields today intellectual property is more like the ghost of Schrödinger's cat,[29] a constant presence/absence that pervades the research process. It is an expression of a utopian capitalistic imaginary where the social benefits of science are broadly shared while economic benefits accrue privately, without either diminishing the other. It is the menace that those who cling to a "public good" model of scientific research rail against. It is the motivating force that has spawned a new category of professional, the innovation manager, and the suite of policies and infrastructures that they administer. Intellectual property is all of these things and more, frequently having less to do with the number of patents owned than with the entrepreneurial mindset that researchers across science and engineering disciplines are increasingly encouraged to cultivate.

[27] *Ibid.*
[28] CGIAR - IEA (2017), Review of CGIAR Principles on the Management of Intellectual Assets. Rome, Italy: Independent Evaluation Arrangement (IEA) of CGIAR. *Available at:* http://iea.cgiar.org/.
[29] The use of the Schrödinger's cat metaphor here acknowledges the influence of Barbara Yngvesson and Susan Coutin's work. These scholars have demonstrated how, in research related to undocumented immigration and transnational adoption, legal and ethnographic accounts retroactively instantiate potential realities that were there all along but are only made visible by official recognition. Yngvesson, B. & Coutin, S. (2008). Schrödinger's Cat and the Ethnography of Law. *PoLAR: Political and Legal Anthropology Review*, 31(1), 61-78.