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Heterodox Science Leadership

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ABSTRACT: Heterodox science challenges orthodox science. Unorthodox science approaches are heterodox if they apply more unconventional, pluralistic views and methods than the leading orthodox tradition. Heterodox science has been practiced ever since science exists. Heterodox scientists have been fundamental drivers of change through pluralistic innovations in many different fields, such as astronomy, physics, economics as well as behavioral sciences, to name a few. Heterodox science can stem from methodological pluralism in acknowledging and applying different methods than conventional science. Heterodox science can also be a reality check in questioning the validity of prevailing results and state-of-the-art methods. The internal validity gets backtested by replication, which has led to scientific advancements in many fields, most recently notable in the widely discussed replication crisis in behavioral economics. The external validity gets evaluated in a reality check of stylized artificial models for applicability to real-world contexts. For instance, historically external validity tests opened the gates for groundbreaking advancements in physics, macroeconomics as well as behavioral insights. In all these accomplishments of heterodox science approaches though, it is also to note that not all heterodox scientists are successful and sometimes they are doomed to be left on the periphery of discussion and not become influential parts of vibrant communities. This paper addresses the question of why heterodox scientists are sometimes successful in breaking new trends and sometimes they are left in the periphery of scientific discourse and do not claim a leadership role. The paper argues that obstacles for heterodox scientists arise if they engage in the following behavior: (1) an obsessive focus on the critique, which can detach socially; (2) an obsessive focus on discrimination of excellence in trying to bring down those who are in power dominating fields and thereby being distracted from contributing to science in better ways of doing research or providing new results; as well as in (3) colleague amnesia and motivated forgetting of citing colleagues, which harms networking advantages and creates silos of knowledge and self-reinforcing echo-chambers in inefficiently one-dimensional school-thinking. The paper closes by providing recommendations for heterodox scientists, who aspire to become leaders-in-the-field, in pointing at positive critique mechanisms in only commenting on research if being able to show a way how to do it better. Science diplomacy can help educate upcoming researchers to offer critique constructively and in a tactful way. Embracing excellence in honest acknowledgment of colleagues' accomplishments and whole-hearted efforts to see others' points of view as well as collaboration attempts with leading scholars are additional strategies to break through with heterodox thoughts without discriminating against excellence. Science advancements to improve the gap between the orthodox and heterodox world include heterodox science ethics and science diplomacy solutions. Open discussions and democratization of knowledge creation can complement the few key journals per field through additional online outlets with international and pluralistic outlooks. Incentivizing collaborations that bridge the divide between orthodox and heterodox scientists is another institutionally-implementable strategy to foster scientific advancement through heterodox ideas. Raising awareness for the concept of colleague amnesia as the motivated forgetting of colleagues' work appears as a favorable institutional move and proactive community standard that can make science a better, more inclusively innovative world.

KEYWORDS: Advancement of Science, Collaboration, Colleague Amnesia, Cooperation, Discrimination of Excellence, Economics, Ethics, Heterodox Leadership, Heterodox Science Ethics, Interdisciplinary Research, Motivated Forgetting, Leadership, Orthodox Science, Pluralism, Science, Science Diplomacy

Introduction

Heterodox sciences challenge the status quo of orthodox research methods and findings. Many historical examples exist in which unconventional ways of approaching conventional research tested the prevailing body of knowledge and led to surprising and most innovative advancements. New ways of conducting research and pluralistic openness incepted entire new fields thanks to

heterodox science approaches. Methodological heterodoxy, reality checks of stylized models and backtesting of given results are three major gateways of how heterodox scientists advance research on a constant basis.

In the historical long tradition of heterodox pluralistic science conduct, it is striking that hardly any source addresses leadership. In the study of heterodox approaches and pluralistic method cases, it becomes apparent that heterodox sciences are risky endeavors with unknown outcomes that tend to polarize. Why is it that some heterodox scientists are successful in creating new ways of thinking and doing to leverage into leaders in the field? And why do some heterodox attempts get stuck on the periphery of scientific advancement and pass without the community noticing them despite a valid point made? In this polarization, what are the key ingredients of successful science transformation that sprung out of heterodox science camps?

This paper starts with providing some of the glorious moments heterodox science has celebrated in the long history of knowledge creation but also addresses potential challenges unconventional approaches face. Major hallmarks of heterodox science victories include the acknowledgment of the earth being round and circulating around the sun. The beginning of nuclear quantum physics. The finding of economic business cycles. And the beginning of behavioral sciences. At the same time, the respective heterodox scientists were oftentimes only credited with their genius talent after considerable time had passed or not at all. This article therefore attempts to also pay attention to why some heterodox scientists have faced problems to inform the community about their unconventional insights and offer suggestions on how to speed the process of innovation transfer in society.

This paper also takes a first stab at mentioning the need for heterodox science ethics and suggests science diplomacy as a way to lead others to follow heterodox science approaches. Obsessive focus on critique, emotional collaterals of discrimination of excellence in the negative suppression of leadership around but also colleague amnesia in the motivated forgetting of citing colleagues' work deliberately are some of the detected areas of improvement for flourishing heterodox sciences (Puaschunder, 2023).

The future success of heterodox science may lie in promoting open discussions and a democratization of knowledge creation in questioning the monopoly hegemony of some 'key journal' outlets and offering additional knowledge transfer means. Positive critique training that helps to comment on mistakes and omissions only if showing a way how to do it better or simply doing it better in one's own research are other suggested recommendations to promote heterodox leadership based on productive research ethics and positive reinforcement forces. Embracing excellence around oneself in collaboration with the leadership appears as an additional institutional change mechanism to help foster heterodox sciences. Colleague amnesia may be classified as a subform of soft plagiarism in order to raise awareness for intellectual schools' deliberate neglect of acknowledgment of others' accomplishments (Puaschunder 2023). Databases could also help proper acknowledgment mechanisms through transparency of research results. Lastly, double-blind review procedures enhanced with feedback and response mechanisms may also help in averting colleagues' unfair discreditation. All these endeavors may aid in constructively advancing science, pluralistically enriching research output as well as shining a positive light on unsung hero heterodox leaders.

This paper is structured as follows: First, heterodox science approaches will be discussed in historic examples. Different categories of heterodox science approaches will be classified as unconventional science approaches by embracing pluralistic viewpoints and methodological advancements; questioning the external validity of stylized models as well as backtesting in replication studies. The observation is presented that some heterodox attempts are highly successful, while others fail to make the case for change and end up not being noticed at all. Then heterodox science leadership will be called for in providing some of the speculative determinants and reasons for success to transform and innovate research or incept completely new fields or state-of-the-art *modi operandi*. On the individual level, the right way

to present critique but also the acknowledgment of leadership around and fair citation strategies may help heterodox approaches get traction. Institutional approaches to foster a pluralistic environment for education and publications could feature career incentives and specific pluralistic trainings but also ethics development to cite conscientiously and science diplomacy appreciation by the community could help. The discussion of this paper calls for future qualitative and quantitative research on success factors of interdisciplinary research as well as transparency in working on an open science catalog of positive examples of how heterodox sciences have advanced academia to motivate future heterodox science leaders and contemporary pluralistic students.

Heterodox Science

Heterodox science is as old as science itself. Heterodox views are those that contest and complement the orthodox schools. Historical examples are found in Eratosthenes of Cyrene, who proved with mathematical geography the earth to be spherical around 194 BC (Rawlins 1982). Another classic heterodox scientist is Galileo Galilei who propagated the Copernican heliocentrism with the earth rotating around the sun as early as 1615 (Finocchiaro 1989; Hannam 2009; Sharratt 1994). The first account of economic cyclical waves was measured by the Russian Nikolai Kondratiev, who was imprisoned for presenting his work and later executed under Stalin (Buyst 2006; Barnett 1998; Kondratiev 1925/1984; Mager 1987). Hyman Minsky (1974) accounts for another proponent of economic wave theories, who is believed to not have been given enough coverage and credit for his understanding of the economy as a recurrent pattern wave-driven (Bernard, Gevorkyan, Palley & Semmler 2014).

While some scientists are winning debates on intellectual grounds, many heterodox scientists, however, remain on the periphery of discourse all their lives as unsung heroes cast out from influential circles that dominate the prevailing scientific spearhead. An example of intellectually winning a discourse but not changing a field is the Cambridge capital controversy of the 1950s and 1960s, in which UK Cambridge attacked the dominant writings on the macroeconomic concept of 'capital' of the US Cambridge group. While the critique appears intellectually valid, the discourse remained more vibrant and centered around the US Cambridge group as for bringing out more novel extensions and advancements than rather been focused on the critique of other people's work.

On the other hand, history also has an amplitude of successful heterodox scientists, who changed fields successfully and lastingly. For instance, the systemic collection of human tissue of the deceased, which was at that time forbidden, became the driving inspiration for Leonardo da Vinci's human form capture in his art, which inspired the Renaissance and elevated realism in the fine arts. Albert Einstein working as a patent office clerk at the Swiss Patent Office became the spring feather for this genius' rebellion against macro-physics in incepting an entirely new field of modern quantum theory in physics. Joseph Schumpeter was inspired by Karl Marx's critique of capitalism in his observation of driving forces between capitalists and working-class living conditions. Yet putting a positive spin on the 'creative entrepreneur' – who needs to constantly innovate to maintain a competitive edge against competitors, which was found as the ultimate driver of productivity of nations – leveraged Joseph Schumpeter as one of the most successful professors of his time (Stanford University Press/Schumpeter 2011).

Law and Economics also originated as a heterodox movement that transformed into an orthodox field. Early Law and Economics scholars started by adding to the prevailing model of legal analysis that focused on ex-post outcomes an innovative analysis of ex-ante incentives created by legal rules. Early Law and Economics scholars' constructive – and sometimes provocative – output helped establish Law and Economics as a vibrant field of mainstream legal scholarship in the US today (Garoupa & Ulen 2022; Gelter & Grechenig 2014). Behavioral economics is another success story of heterodox scientists thinking beyond disciplinary borders.

The psychologists Daniel Kahneman and Amos Tversky started using laboratory experiments to test neoclassical utility and efficiency assumptions and found human beings deviating from rationality (Kahneman 2002).

Many of previously considered heterodox scientists advanced over the course of their productive lives from the periphery into leaders in the field. John Maynard Keynes, Lawrence Summers, Joseph Stiglitz, Michael Porter, Richard Thaler and David Laibson are examples of contemporary scholars who started out heterodox to then become some of the most prolific leaders in their own fields, which they created. These scholars were rather focused on their own way of thinking and capturing their ideas in eccentric approaches than being consumed by the status quo and spoiling their own creativity by studying and reiterating what others have done or known before.

Why are some heterodox scientists doomed to prevail in the periphery and others successful in incepting a new field? What are the success ingredients of heterodox science leadership? And what institutional support can be granted to scientists to make their unconventional ideas flourish? This article tries to address these unsolved questions. Asking what key ingredients predestine heterodox science leadership is novel and important if one imagines the innovation potential that pluralism offers. The fact that many Nobel laureates address their solitude in the beginning when boldly walking on new territories or doing research in a completely new way implicitly lets us imagine the risky path of heterodox scientists that can pay off with the most acclaimed research honors, if done wisely and strategically.

Heterodox science challenges the orthodox view through methodological advancements. Embracing a wide range of methods that are either invented or applied from other fields can become a vital ground for unconventional science approaches. Changing views from micro- to macro-analysis in physics or economics are examples of methodological advancements. Unorthodox pluralistic methodological approaches are also open to other disciplines and thereby extend the prevailing methods in other fields. Heterodox science is also employed with reality checks of stylized models. For instance, in physics and medicine, direct validity tests are applicable. The current scientific state of the art can become subject to scrutiny if it applies to capture physical laws accurately and if patients get better thanks to medical care. Innovations in focusing on atomic components of all things but also medical advancements as simple as focusing on hygiene around sick patients are examples of major advancements that came out of heterodox science approaches.

The concrete backtesting of given data-driven findings has become en-vogue in social sciences. Examples are camps retesting data-driven social science studies that are predicted to be replicable in only about 60-70% of the time. The so-called 'replication crisis' in behavioral economics has seen influential psychologists and behavioral economists' careers being ended over backtesting and irreplicability of previous results. Open science approaches and pre-registering studies in advance but also data check mechanisms that are currently forming to improve the behavioral economics field for control of data reliability are the newest advancements, which will hopefully also inspire other fields. In macroeconomics, since the 2008/09 World Financial Recession, central banks have started to publish economic variables more openly and invite backtesting of their predictions in the hope to find patterns and correcting for errors more efficiently thanks to a pluralistic approach.

Heterodox Science Leadership

In the study of heterodox science, the question arises why some heterodox scientists are successful in incepting new fields and correctly improving the status quo, while others are doomed to stay unnoticed or on the periphery of the discourse throughout their careers. In order to build heterodox science leadership credentials, positive heterodox science ethics of researchers and institutionalized science diplomacy may help.

This paper will first focus on individual differences in heterodox scientists in order to retrieve success factors of heterodox science leadership in breeding favorable professional science ethics. The article will then recommend institutional changes in order to foster unconventional heterodox ethics and pluralistic leadership into a more influential endeavor.

One of the main differences between successful and unsuccessful heterodox scientists appears to lie in the nature of the critique. If research becomes an obsessive focus on critique and papers end in just criticizing the agenda, principles and conduct of other researchers, heterodox rebels may lose any constructive crowd and collegial allies. One simply does not win positive crowds with negativity. And readers may be left feeling something is missing if a paper is only a critique but does not provide any new insights or a solution on how to make it better. Even with students, it is a wise idea to allow critique in the classroom among peers only if brought forward in a diplomatic way that is encouraging and only if being bundled with concrete steps on how to improve the research.

Another problem of unconventional scientists who make themselves unprominent is when discrimination of excellence occurs. Discrimination of excellence concerns focus on bringing down leadership and those who are at the center of discussion. If the motivating driver of researchers is primarily to oppose the leadership for the sake of opposition to those in power, the core of what science is about gets lost, namely the aspiration to exchange ideas with like-minded scholars and trying to learn from those around.

Another destructive force against heterodox science leadership is colleague amnesia (Puaschunder 2023). This kind of motivated forgetting of colleagues' work appears to be common to bring down like-minded scholars in a passively aggressive way of neglect (Puaschunder 2023). Hardly any mechanisms exist – besides conventional reviews – to address the problem of systemic silos or schools that per se neglect to acknowledge and cite each other's work. Heterodox scientists may be advised to cite the leadership they aspire to become to raise awareness of their work but also only critique colleagues if the critique is followed by showing a way how to do it better.

All the mentioned deficiencies – obsessive critique without showing how to make it better and discriminating against those who are at the center of discussion for their excellence – can be surmounted by positive heterodox science ethics and science diplomacy.

Heterodox Science Ethics and institutionalized science diplomacy

In order to breed positive heterodox science ethics, institutions can aid with open discussion mandates and democratization of knowledge creation. Often critiqued is the hegemony of a few key journals that dominate fields and procreate silos of positive reinforcement of publication circles that practice collective colleague amnesia to other circles. How hard it is to break into insider circles and infuse stimulating new ideas that may offer ways how to make it better is often a challenge mentioned by foreign researchers, scientists from different fields or upcoming scholars. Offering online outlets has improved the variety of publication opportunities as well as opened access to more diverse, interdisciplinary and international groups to comment on emerging scholarship. Sponsoring open science publications institutionally may further this trend.

Most recently popular media outlets have started to address the list of top-ranked journals with the quest for additions from the field of finance in an attempt to stretch the possibilities for publication and extend the list of top journals for a more pluralistic view (Cronin, 2023). Institutions can aid with fair placements of editors-in-chief and credible reviewer dynamics. Professional associations, including interest groups and stakeholder engagement outlets, could aid with oversight of journal executive placements and fair reviews. Professional associations and institutions may also help in incentivizing fresh and innovative out-of-the-box ideas. Educational institutions, professional bodies and career review processes could help with featuring institutionalized trainings, review mechanisms and

incentives for positive critique. Only commenting on others' work for the sake of showing a way how to make it better is one of the most valuable insights for heterodox scientists. Positive reinforcement and constructive critique should become a standard feature of every academic training. Institutional oversight and transparency via social online media but maybe also databases from professional bodies can help curb harmful critique that rests in the negative and discriminates against excellence in unbalanced attempts to bring down leadership. Careers could be made dependent on positive leadership featuring constructive critique and honest aid of upcoming scholars in helping to improve work. In addition, trainings and networking could foster collaboration with leadership, also in the contractual agreements with educational employers. Incentives could be offered for intergenerationally diverse but also interdisciplinary research endeavors alongside clear focus on bundling heterodox schools with orthodox institutions. One institutional attempt to do so are interuniversity consortia. For instance, the largest in the world is the Interuniversity Consortium of New York, in which traditional orthodox schools bundle up with heterodox places in order to foster a stimulating discourse and respectful exchange of ideas.

Institutional mechanisms could also target colleague amnesia (Puaschunder 2023). If institutional waves would break that call out colleague amnesia and define it as a subform of plagiarism, colleagues would be incentivized to give fair credit to inventors of ideas. In all these deficiencies, institutional databases could help fair credit giving with implicit acknowledging mechanisms through transparency of inspiring research. Double-blind review procedures could integrate a communication channel and should feature response mechanisms that help avert colleagues' unfair treatment and unjustified discreditation for institutional competitive advantages (Puaschunder 2023). Lastly, online mechanisms – such as exchange platforms about institutions and their conduct around heterodox science ethics – would become valuable crowdsourcing of information. For example, online anonymous databases and information exchange opportunities promise to aid in career move decisions as a source of insider information as well as may curb harmful uncollegial behavior in fear of transparency about scientific ethical misconduct.

Discussion

Heterodox sciences account for advancing research fields in some of the most innovative ways. In the long history of paying attention to pluralistic approaches to solve intellectual problems most creatively, strikingly hardly any information exists why some heterodox scientists are highly successful in changing the status quo of science and others are doomed to fail in making their valid point to the community and therefore remain in the periphery rather unnoticed.

This article attempted to provide some historical anecdotes on heterodox sciences in order to derive interpersonal and institutional recommendations on how to improve heterodox research introductions. Heterodox science was first acknowledged for its unconventional, more plural viewpoint than the leading orthodox tradition. Heterodox science also prevails in methodological pluralism applying different methods than conventional state-of-the-art *modi operandi*. Heterodox science is also active in a reality check questioning the validity of the current results. The internal validity gets backtested by replication, which has led to scientific advancements in many fields. The external validity gets evaluated in a reality check of stylized artificial models to hold in the real world.

Heterodox scientists are advised to refrain from an obsessive focus on the critique, which may not engage constructive crowds who focus on efficient solution-finding through novel insights and engage in respectful dialogue with peers. Heterodox scientists may also fail to build a supportive network if practicing discrimination of excellence. Trying to bring down those who are in power dominating the field may distract from contributions to the field in better ways of doing research or providing new insights as well as methodological advancements. Heterodox

researchers should also not engage in colleague amnesia. This kind of motivated forgetting of citing colleagues actually harms networking advantages while establishing silos of knowledge and self-reinforcing echo chambers in repetitive one-dimensional school thinking.

Institutional recommendations for heterodox scientists point towards creating positive critique mechanisms and educating on science diplomacy in tactful ways of critique (Puaschunder forthcoming). Institutional associations may create opportunities and incentives to embrace excellence in honest acknowledgment of colleagues' accomplishments. Good governance standards may promote whole-hearted efforts to see others' points of view as well as support collaboration attempts with leading scholars. Science community standards could open discussions and democratization of knowledge creation by offering a multitude of journals with plural outlooks.

As for future research strategies, heterodox science leadership should be thematized in qualitative and quantitative research. Laboratory and field experiments on success factors of heterodox science leaders may follow a preliminary investigation of historical examples of successful unconventional scientists and their research strategies and pluralistic methodological approaches. Interdisciplinary connections and successful pluralistic cross-pollination should be studied qualitatively and quantitatively in order to derive recommendations on success factors of interdisciplinary research. This will also help quantifying the likelihood of success for various interdisciplinary research attempts. Transparency enhancement and an open science catalog of positive examples may help in educating a new cadre of tomorrow's future heterodox science leaders.

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