Beyond Karl Popper's Individualism of the Heroic Age in Science

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Abstract

Popper centrally considered the importance of the individual, both in philosophy of science and in political philosophy. In both science and politics, he lauded the freedom of the individual and considered it sacrosanct. An element of the background for this is that Popper lived his formative years during what still seemed a heroic age in science, where significant discoveries in science proceeded out of the crucible of individual minds. This is why Popper is generally perceived as shaping his understanding of science as though the scientific method is one that is wielded only by the individual researcher. In this paper, I consider the issue of Popper within what still seemed a heroic age of science. My discussion of the heroic age of science will lead me to consider Popper through Isaac Newton (1642-1727), Albert Einstein (1879-1955), and also the philosophy of Newtonian science that was developed by Immanuel Kant. Although such a caricature of Popper's individualism on scientific method possesses a grain of truth, on the other hand, Popper did also recognize both earlier and more deeply than any of his contemporaries in philosophy of science the need to acknowledge social or communitarian aspects of the scientific process.

Keywords: heroic science, social, individualism, Popper, scientific method

Introduction

The affirmation that individual scientists are usually credited with their discoveries cements the recognition that all scientists stand heroically on the plaque of their inventions. The history of science is replete with heroes of scientific discoveries of the kind whose theories, conceptions and methods are uniquely determined by what the individual scientists do. The beginning of what is considered the 'Heroic Age of Science', therefore, is traceable to the early Greek period where what was scientific was determined by the crucible of the individual scientists, and science was simply the sum of what individual scientists did. Thales of Miletus, for example, explained the physical cosmos within the confines of his understanding of the natural order, rather than the supernatural. Aristotle was a hero in many fields of science. The heroic status of Hippocrates in the field of medicine is reputable. Many others such as Theophrastus, Dioscorides, Pliny, and Galen contributed various ideas, theories, and discoveries to biological science (Heidel, 1933:91).

The essential point of this discussion relates to the degree of individualism upon which rests the final outcome of scientific theories, rather than the degree to which a community of scientists critically peer review such outcomes. To this end, Karl Popper's falsification method can be said to model the idea of error elimination and corroboration to how the individual scientists proceed and finalize their researches. This perception is not very unlikely because Popper began his voyage into science at the time of what still seemed to be a heroic age of science. This discussion of the heroic age of science in Popper's philosophy of science will be looked into through the scientific outlook of Isaac Newton (1642-1727), Albert Einstein (1879-1955), and also the philosophy of Newtonian science that was developed by Immanuel Kant. An explicit overview of Popper's philosophy of science depicts a general sense of individualism, particularly, on scientific method. However, Popper did also recognize both earlier and more deeply than any of his contemporaries in philosophy of science the need to acknowledge social or communitarian aspects of the scientific process. This is the art of rewarding the implicit social dimension in Popper, and acknowledging how Popper's idea of inter-subjectivity generally embellishes his scientific pluralism.

On the Heroic Age of Science

The issue as to what extent science really is a heroic activity could be considered as to how possible it is for science to just be what a scientist does, times the number of scientists that there are. Clearly, some individuals in the field of science, such as, Einstein, Newton, Marie Curie, Charles Darwin, Galileo Galilei, Nicolaus Copernicus, Thomas Edison, Max Planck, Niels Bohr and Johannes Kepler, do uniquely stand out in their postulation of theories.

Eponymy is a prize in science, partly because it suggests that what science really is, is just what the scientist achieves or engages in as the discoverer of some eponymous law. In eponymy, sometimes you get pairs, for example "Belousov-Zhabotinsky reaction" or "Aharonov-Bohm effect", but one scarcely gets more than pairs and most often one gets single solitary names. So, eponymous effect creates the impression that science is what these individual scientists do, or what a scientist does, times the number of scientists that there are, except that some are more significant as scientists than others (Afisi 2016:70). From this background, one can say blandly that science is the sum of what individual scientists do. With eponymy in science, the heroic era where scientific researches and discoveries are attributed to the individual scientists becomes preeminent.

Popper was born very much into times when this additive, individualistic view of science was the prevailing conception. According to

the kind of view of the history of science that certainly was still official in Popper's days, science proceeded into fully fledged existence already in a heroic condition.

It is important to mention that it was not until the nineteenth century that the term 'scientist' was invented. It was during this time that people mostly used the term 'science' to designate the intellectual activity that had descended from natural philosophy. The word 'scientist' reinforces the conception that scientists are to science somewhat as building blocks are to a building, you just add them up, or add their effects up, and you get science. Although not commonly used at the time, one can with hindsight, by backwards projection of the word 'science', trace the onset of up-and-running science to the seventeenth century, perhaps to Newton, perhaps to Galileo Galilei (1564-1642) or to some other set of figures such as Nicolas Copernicus (1473-1543) or René Descartes (1596-1650). The usual pattern for these figures is to consider their defining contributions eponymously. Their names or appellations have been ascribed to their discoveries. Their names were amplified by how their scientific achievement was made out eponymously. This is instantiated in Copernicanism', 'Galileo's law of falling bodies', 'Descartes' analysis of the rainbow', 'Newton's law of motion', 'Boyle's law', 'Cavendish's experiment', and 'Darwinian theory'. So, according to the usual view of the history of science, when science first got to be up-and-running, it was already in a heroic condition. Science was identified significantly as being created by the heroic individual researcher.

However, contemporary conception of science indicates an emergence of a new stage of science which called for 'total-system models' adequately reflecting the intricate interconnectedness of multilevel, multi-goal organisations in which positive and negative feedback processes give rise to alternative decision modes" (Marney and Schmidt 1976:191). The new multilevel model embraces an interdisciplinarity nature of science which benefit from the act of "borrowing of knowledge from one field in order to assist the endeavours of another discipline" (Kellert 2006:219). This brings about what can be referred to as methodological pluralism as a legitimate scientific inquiry. Scientific pluralism enhances social interconnectedness of science and embraces the peer-review nature of community of scientists. Although this interdisciplinary science creates a tying-together of the field, each field of science remains distinctive from others. Scientific pluralism ensures that heroic times for science disintegrated.

This conception of pluralism in science emphasizes that science is a profoundly social activity. In contemporary times, the social organisation of science has significantly changed from the heroic era of science. Compared to

when Einstein possessed his celebrity status, the social organisation of science has changed in ways that remove individuals from the limelight. These days, there is not so much eponymous science projected since publications in science generally have a great many authors. The times are past when scientific problems could be addressed by bench-top laboratory work by an individual or by a small number of individual researchers. A lot of scientific activities are now very sizeable, in the sense of bringing together very large teams. Problems in science typically crumble or easily get resolved under a many-sided kind of pressure that is exerted by a diverse and very large team of people. One no longer expects that another Einstein or Newton would emerge. Even if science were to change or advance profoundly, it is not so much expected that it would be traceable to the intellect of any one individual scientist. This multilevel model of science has changed the organisation of science with science becoming inestimably social. Its operation has become dependent more upon interrelationship between individuals than upon the spectacular genius of certain great individuals working in some kind of significant solitude.

It is possible to argue either way on the question how affected Popper was by the official understanding of science as a heroic activity. The idea that science is a heroic activity nevertheless strongly maintained itself through to Popper's time. He did seem to present as his understanding of science a description of a method that could potentially be wielded by an individual researcher. Popper no doubt capitalised upon the idea that, by wielding this method, the individual scientist becomes a paragon of critical rationality professionally. It is no wonder that Popper is so beloved by scientists, given how far he flattered them in the image he created concerning their special worth (as individuals). On the other hand, Popper emphasised rather more than any other philosopher of science of the first half of the twentieth century the dependency of science upon community.

Moreover, unlike many early logical positivists, Popper understood fully and completely that science is fallible. An expectation that prevailed for a long while after Newton is that truly scientific accomplishments would all be enduring. The idea was that past scientific accomplishments could be further accredited, but they could not be corrected. The idea was that because past scientific accomplishments were scientifically established and lawful they were necessary and therefore forevermore certain. For example, this can be seen in the way that Kant endeavoured to explain how Newtonian physics is possible as knowledge. Kant argued that Newtonian physics is final so that although it can be further accredited, it cannot be either refuted or superseded (Friedman 2012:486).

Popper may derive inspiration from Kant in important ways, but he of course completely dismissed Kant's expectation that Newtonian science is certainly true or necessarily true (Popper 1963:27). This is expected since Popper lived during times in which Newtonian science had been made false and refuted. The remarkable thing about eponymous science in Popper's day was that it almost, in every element, overturned significant earlier reaches of science. Whether we consider the theory of blackbody radiation of Max Planck (1858-1947), the theory of the atom of Niels Bohr (1885-1962), or Einstein's theories of special and then general relativity, all of them, as eponymous contributions, represent correction of science that had gone before not accretion to former science.

Einstein and L. Infeld (1898-1968) together wrote a popular book called *The Evolution of Physics* (1938). This book details the way in which the latter half of the nineteenth century was a watershed: the old expectation about steady accretion to science met at that time its undoing. The new theory of fields just would not satisfactorily resolve itself as an extension of the old theories of mechanics (Pais 1982:63). Attempts to bring about unity between Newtonian mechanics and field theory were unsuccessful. Mechanical conceptions of electromagnetic fields were attempted, but they could not be made to work (it is the velocity-dependence of the electric or magnetic forces that interferes with making a mechanical ether theory of electromagnetism work) (Pais 1982:66). As a result, from shortly before Einstein, the attempts to reduce electromagnetics to mechanism were turned upside down. For a while, electromagnetic explanations were attempted for mechanical phenomena. Yet this programme (called the 'electromagnetic world picture') also could not be made to work. To unify physics, you needed to shift its concepts, and not simply use the concepts that were already in place. The change needed to be no mere 'change within a framework' but more considerably, a total 'change of framework'. By the time of the writing of the Einstein and Infeld's book, significant unifying accomplishments of this new kind had been made (by Einstein chiefly) and that had led to new successes in the theoretical comprehension of phenomena. Yet the effort was by no means complete and the emergence of the quantum theory struck Einstein as a new kind of impasse, an impasse that he hoped in vain he could get beyond, by some new shift in concepts (Finster & Kleiner 2015:4).

Popper was struck by the readiness of leading scientists such as Einstein to 'go back to the drawing boards' and quest for better concepts or a better theory. He took their example to indicate sharply the fallibility of science. Individual scientists such as Einstein were capable of originating veritable breakthroughs in science. Popper derived enormous inspiration

from Einstein as a scientist. Popper's postulation of falsifiability as a criterion of science itself looks to what he believes that it is possible for an individual scientist to do. However, Popper regarded no such scientific breakthrough as revolutionary. Even the process of conjecture and refutation, of trial and error, is a piecemeal method, in Popper's understanding of it (Popper 1963:61). That is a point of connection between Popper's critical rationalist conception of science on the one hand and his critical rationalist conception of worthy political reform on the other hand. The heroic scientist does not dismantle the whole ship (to refer to a metaphor credited to Popper's contemporary, the positivist Otto Neurath (1882-1945) except perhaps one plank at a time replacing each plank as the effort goes on (Neurath 1921:191). Every step is as conservative as it is also bold, and that alone helps make it courageous.

Popper's Social Aspect of Science

Popper's outlook on science is no doubt significantly individualistic, but there is also a communitarian balance. He emphasized the fallibility of every conjecture and the need for inter-subjective criticism and severe testing of every idea that is advanced. One aspect of Popper's communitarianism is his insistence that scientific conjectures are inter-subjective and are all brought to the public domain where peer-review is allowed and is essential.

Popper lived near the end of what was a heroic age in science. The significant effect of this on his understanding of the relationship between individual and community can be found in his reaction to the current dominant strand of thought of his time, namely logical positivism. Contrary to logical empiricism, Popper developed a different variant of the concept of the unity of method. The logical positivists had argued that science follows one and the same universal method across all its sub-disciplines and alone is meaningful. They insisted that any other kind of inquiry is meaningless. However, Popper held that even though falsification is a single specifiable method which can be taken as a criterion of all the sciences, it does not preclude other modes of inquiry. Popper even held that there can be non-scientific, metaphysical inquiry, that later emerges as a mode of scientific inquiry. Popper had in several of his writings stated that his philosophy of science was not averse to metaphysics. In fact, W. W. Bartley III has written that Imre Lakatos's "Methodology of Scientific Research Programs" is simply Popper's own methodology of metaphysical research programmes, Lakatos merely changes the name 'metaphysical' to 'scientific'. Bartley's citations of Popper in "Theories of Demarcation between Science and Metaphysics" defends the claim on Popper as a methodological pluralist. In Popper's own words, "we are not to condemn the metaphysical phase, for that might have

been a necessary step to get a new science going" (Popper 1959:19, 38, 252., Bartley 1968:47-54., Popper 1968:93-98., Bartley 1968:115, 118). This is an argument for plurality of methods; and it is social in character.

The goal that pluralism is intended to achieve in scientific theory and methodology is to rebuff the assumption of the universalists who hold the view that scientific practice and scope can be monolithic and reductionistic. Popper's falsificationist methodology is anti-universalism because universalism cannot be reconciled with the balance of individual and social elements that underlies Popper's critical rationalism. Popper urges us to be critical. In order to be critical, we must question the prevailing scientific approaches to problem-solving. Open and critical discussion is essential to the way knowledge progresses in science and political society. In engaging in critical discussions, different approaches to problem-solving may be entertained. A plurality of ideas emerges in the process of problem-solving. Potential solutions to problems in science are debated within the scientific community. Critical rationalism therefore has a vital social element.

I will argue next that Popper learned significant lessons from Kant concerning the need to consider science to be communitarian. Popper did not let go of individualism entirely, but he nevertheless balanced this with equal emphasis on the community. Thus the image that science had begun within and still remained within a heroic age, while it was undoubtedly part of Popper's intellectual context and influenced his philosophy, by no means completely took over his thinking.

Some Influences of Kant

Popper had high admiration for Kant. Popper in fact, referred to himself as "an unorthodox Kantian" (Popper 1974:82). A Kantian is one who accedes to the principles underlying Kant's philosophy without significant revision. 'Unorthodox' is of course, a caveat on 'without significant revision'. His philosophical interest in Kant led Popper to devote an entire chapter to Kant in *Conjectures and Refutations: The Growth of Knowledge* (1963:33-59). This strong influence of Kant on Popper is discernible both in Popper's idea of individual freedom and his socio-communitarian elements.

Let us be clear that Kant models balance between individualism and communitarianism. In his *Grounding for the Metaphysics of Morals* (1785), Kant viewed the human individual as a rationally self-conscious being with 'impure' freedom of choice. He considered that for an individual will to be regarded as 'free', it must be understood as capable of effecting causal power without being caused to do so. Kant himself averred, however, that the idea of a lawless free will, that is, a will acting without any causal

structure, is unintelligible, and consequently unacceptable. Therefore, a free will must be a will that acts under laws that it gives to itself (Kant 1785, trans. Ellington 1993:6). Popper found this Kantian idea of ethical individualism to be convincing; and it was a doctrine that Popper developed into his idea of individual freedom. So, in one aspect of his political philosophy, Popper favoured individual freedom. His liberal political philosophy upheld the ultimate freedom, well-being and rights of the individual. This individualism that he derived from Kantian ethics permeates all aspects of his philosophy - from science to politics. As Anthony O'Hear acknowledges, "Kantian ethical individualism was a presupposition of Popper's *The Logic of Scientific Discovery* (O'Hear 1995:283).

Yet, Popper's ethical individualism is balanced by Kant's prioritization of inter-subjectivity to subjectivity. Just as there is a socio-communitarian aspect of Popper's philosophy, there is good reason to see this as coming from Kant. Kant's categorical imperative denotes a moral unconditional requirement that all individuals must follow in all circumstances; it is justified as an end in itself. Kant (1785 trans. Ellington 1993:30-43) offers three basic formulations of this categorical imperative:

1. Act only according to that maxim whereby you can at the same time will that it should become a universal law without contradiction.
2. Act in such a way that you treat humanity, whether in your own person or in the person of any other, never merely as a means to an end, but always at the same time as an end.
3. Act as if you were (through your maxim) always a legislating member in the universal kingdom of ends.

Kant held these three formulations to be fully equivalent to one another. In which case, the three formulations of the categorical imperative are, in Kant's view, one principle, namely the supreme principle of morality.

Although the first and the second formulations do not seem broadly concerned with the idea of community of agents, the third formulation roundly delivers a socio-communitarian aspect of Kantian philosophy. The first formulation of the categorical imperative demands that the form of an individual's action is one that could be universalized. This formulation at first blush seems merely formal and in that way devoid of any communitarian import. However, that would be a wrong interpretation, if the first formulation really is equivalent to the other two. The second formulation narrowly exhibits a communitarian tendency, as it is concerned with the idea of the self whose action is considered in relation to some specific other person. The third formulation is roundly communitarian. Its moral proposition entails that every individual action must be considered in such a way as it concerns

the entire community of agents and what it would be for that community to harmonize.

Conclusion

To consider the Kantian backdrop this way helps to make social element in Popper's philosophy comprehensible. The argument can be made that, from Kant's categorical imperative, Popper developed a social element for scientific process and in that way curtailed his individualism. It can then be averred that the central element of Popper's critical rationalism entails both individual and social aspects. The individual aspect upholds the sanctity of freedom for the individual scientist. However, such a commitment to freedom does not in any way entail a disregard to the dependency of science upon community. More importantly, the essentials of both individual and social aspects of Popper's philosophy are grounded in his epistemological arguments of intersubjective criticism and upon mutual criticism that his falsification method entails.

This outlook to science is what Popper replicated in social and political philosophy with his attempt to establish an ideology for human freedom, which he realized was not present in the totalitarian society of Europe at the time. In establishing an ideology for human freedom, Popper was motivated by the Kantian ideologies of ethical individualism as well as the three formulations of categorical imperative. Popper also acted as a re-creator of the Kant's essay "What is Enlightenment", stepping forward within the troubled times he lived in much as a figure such as Kant would have recommended. This undoubtedly meant that with Kant, Popper succeeded in balancing individualism with communitarianism in his thinking. Also, Popper was inadvertently influenced by Wittgenstein's idea of speech community. These ideas generated in Popper the need to establish a liberal ideology that would recognize the primacy of individual freedom, while at the same time it does not require a disregard for the value of community. This forms the basis of the individual and social aspects of Popper's political philosophy.

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