



Anton Pannekoek's Epistemic Virtues in Astronomy and Socialism

Personae and the Practice of Science

55

CHAOKANG TAI AND JEROEN VAN DONGEN

Anton Pannekoek (1873-1960) was both an innovative astronomer and an influential Marxist. In this article we will investigate both his Milky Way research and Marxist philosophy, with special focus on his ideal scholarly persona and the epistemic virtues he advocated in his research. This focus allows us to place Pannekoek in the larger development of scientific methodology during the nineteenth and early twentieth century and, most importantly, offers insight into how Pannekoek's scientific and socialist research were related.

Anton Pannekoek en zijn epistemische deugden in astronomie en socialisme. Personae in de praktijk

Anton Pannekoek (1873-1960) was zowel innovatief astronoom als invloedrijk marxist. Dit artikel bespreekt zijn onderzoek naar de structuur van de Melkweg en zijn marxistische filosofie, waarbij we in het bijzonder onze aandacht richten op Pannekoeks epistemische deugden en de daarmee geassocieerde ideale persona. Dit perspectief stelt ons in staat om Pannekoek in de bredere ontwikkeling van de wetenschappelijke methodologie in de negentiende en vroege twintigste eeuw te plaatsen. Voorts biedt het ons inzicht in hoe Pannekoeks sterrenkundige en socialistische onderzoek gerelateerd waren.

Introduction

In recent years much research has been conducted on the scholarly or scientific 'persona'. This research expressed different but related ideas of what the concept of a persona actually is and how it can aid in

understanding scholarship historically. On the one hand, personae have been interpreted as exemplars of what a scientist ought to be and how he should produce his work.¹ On the other hand, personae have been construed as public masks, for instance as identities that could bolster the public image of scholars and justify characteristics that might otherwise be perceived as flaws.² In both cases there is an obvious tension between the idealisations captured and the realities scientists faced: personae are particularly intended to help in giving direction to, and justification of scholars' activities.³ As such, they provide a moral imperative: they are closely linked to the circulation of epistemic virtues, as these too, express moral guidelines that should be internalised when aiming to gain knowledge.⁴ The scholarly persona acts as an embodiment of these virtues. At the same time these virtues can be seen as technologies of the self that serve to mould the self in the direction of becoming a model scholar. Historians of science Lorraine Daston and Peter Galison for example, have shown how nineteenth century strivings for the most 'objective' or mechanically produced scientific representations of the world went hand in hand with a conception of the ideal scientist as someone who suppresses his intuitions to such an extent that he may best be compared with a recording machine.⁵

Daston and Galison's account is unapologetically 'mesoscopic' as it tracks the *longue durée* dynamics of epistemic virtues, their associated personae and their larger cultural and scientific reverberations.⁶ However, as we will argue here, as a historiographical tool the persona and the associated epistemic virtues it reflects are also quite useful in studying individual cases: they allow us to bridge the gap between the microscopic and the mesoscopic, as they aid in understanding how the mesoscopic influences the way particular knowledge is produced by an individual scholar. Furthermore, a focus on personae enables us to look beyond the constraints of disciplinary boundaries in scholarship, and thus contributes to a 'post-disciplinary'

1 Herman Paul, 'What is a Scholarly Persona?: Ten Theses on Virtues, Skills, and Desires', *History and Theory* 53:3 (2014) 348-371 DOI 10.1111/hith.10717.

2 As e.g. in the case of absentmindedness and emotional detachment; see Gadi Algazi, 'Scholars in Households: Refiguring the Learned Habitus, 1480-1550', *Science in Context* 16:1-2 (2003) 9-42 DOI 10.1017/s0269889703000681.

3 For example, radar and nuclear physicist Merle Tuve ascribed moral and aesthetic virtues to a proper scientific identity that contrasted greatly with the realities of science during the cold war:

Jessica Wang, 'Physics, Emotion, and the Scientific Self: Merle Tuve's Cold War', *Historical Studies in the Natural Sciences* 42 (2012) 341-388 DOI 10.1525/hsns.2012.42.5.341.

4 Paul, 'What is a Scholarly Persona?'.

5 Lorraine Daston and Peter Galison, *Objectivity* (New York 2007).

6 Daston and Galison even express that their approach may be considered 'superficial' as they do not dig too deep into individual cases: Lorraine Daston and Peter Galison, 'Response: Objectivity and Its Critics', *Victorian Studies* 50 (2008) 666-677 DOI 10.2979/vic.2008.50.4.666.

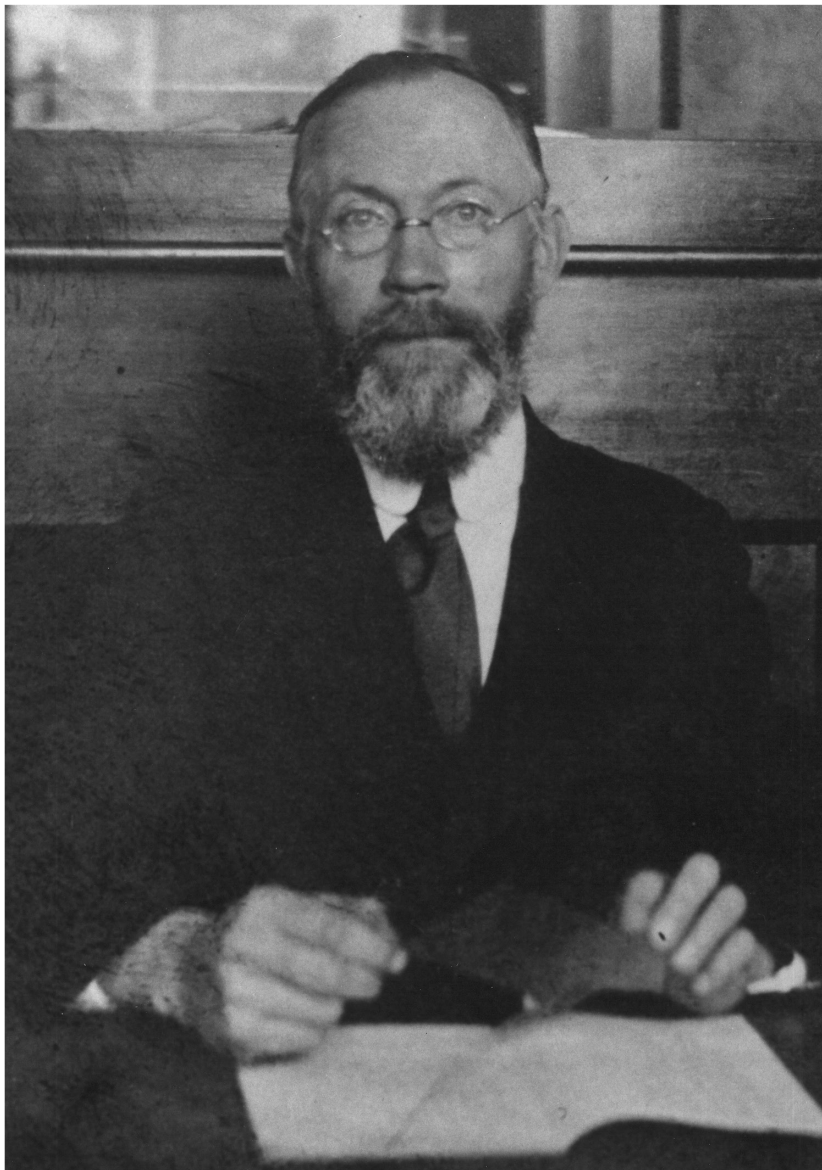
approach to the historiography of knowledge.⁷ Obviously, epistemic virtues and idealised personae are also related to a scholar's larger moral and personal convictions.⁸

In this paper, we will attempt to attain a unified understanding of the epistemic positions of the Dutch astronomer and Marxist Anton Pannekoek (1873-1960). We will try to see how the microscopic and mesoscopic level might interact, and how personae and virtues can aid in attaining a post-disciplinary understanding of scholarship. Pannekoek was professor of astronomy at the University of Amsterdam and an internationally prominent theorist of Marxism. His prominence in two widely differing fields makes him an ideal subject for studying how research across such disciplines can still be related in complex ways. Unfortunately, historians studying Pannekoek so far have made little attempt to integrate his two professional lives. They have focused almost exclusively on Pannekoek's career in political philosophy, which has been treated without consideration of his scientific work.⁹ Thereby they followed the strict separation between the two spheres of his scholarship that he himself always emphasised. The separate personae that Pannekoek implicitly imagined for Marxist study and for science however, will show that these domains were actually closely related. In particular, the links between Pannekoek's epistemic virtues and his philosophy of mind will illuminate the relation between his practice and methodology in Marxism and astronomy. Thus we will see how a focus on epistemic virtues and the personae that represent them could assist in understanding the full relation between different disciplinary spheres of scholarship. Obviously, in the case of Pannekoek this also deepens our understanding of his intellectual biography.

7 On how virtues and personae were shared across disciplines, see e.g. Herman Paul, 'The Scholarly Self: Ideals of Intellectual Virtue in Nineteenth-Century Leiden', in: Thijs Weststeijn, Jaap Maat and Rens Bod (eds.), *The Making of the Humanities. Vol. 2: From Early Modern to Modern Disciplines* (Amsterdam 2012) 397-411.

8 For example, the ideal scientist according to prominent astronomer Arthur Eddington was largely shaped by early twentieth century Quaker values such as pacifism, 'seeking', and internationalism. See Matthew Stanley, *Practical Mystic: Religion, Science, and A.S. Eddington* (Chicago 2007).

9 See H. Schurer, 'Anton Pannekoek and the Origins of Leninism', *Slavonic and East European Review* 41 (1963) 327-344; Serge Bricianer, *Pannekoek and the Workers Councils* (St. Louis 1978); Marinus Antonius M. Boekelman, *The Development of the Social and Political Thought of Anton Pannekoek, 1873-1960: From Social Democracy to Council Communism* (PhD Thesis; University of Toronto 1980); John Gerber, *Anton Pannekoek and the Socialism of Workers' Self-Emancipation, 1873-1960* (Dordrecht 1989); Hans-Manfred Bock, 'Die Marx-Dietzgen-Synthese Anton Pannekoeks und seines Kreises', in: Marcel van der Linden and Bert Altena (eds.), *Die Rezeption der Marxschen Theorie in den Niederlanden* (Trier 1992).



Anton Pannekoek sitting behind his desk (1919).
Anton Pannekoek Institute for Astronomy,
University of Amsterdam.

Pannekoek never explicitly formulated an ideal scientific persona or ideal Marxist scholar. Nevertheless their contours are revealed when looking at the motivations he put forward for his practice of science: by considering how Pannekoek reacted to the work of other astronomers and other Marxists, and how he suggested correcting their perceived flaws, we obtain an understanding of how he envisioned his ideal astronomer and his ideal Marxist. We can then compare these two ideals and see how they relate to one another. Crucially, this connection between practice and persona flows in both directions. As in the case of the 'objective' scientist, the virtues of the ideal persona are reflected in the methodologies of the research that is conducted and in the sort of scientific answers that are considered acceptable. It is this interaction between practice and persona that we want to bring forward here. We are not primarily interested in how virtues are transferred from one scholar to the other; foremost we are interested in how these virtues and ideal personae actually shape science, how they play a role in the type of questions that are asked and the sort of answers that are acceptable across disciplinary divides.

To illustrate this point we briefly consider the example of Albert Einstein, who himself obviously functioned as exemplar. Aware of this, he actively reshaped his own history in an attempt to redirect his discipline, theoretical physics, in opposition to the convictions of the majority of his colleagues. Crucially, his recollection of his path to the general theory of relativity, the most important of his achievements, was altered in order to reflect less the way the theory was actually developed, but rather the way that the older Einstein believed theoretical physics should be conducted.¹⁰ Einstein re-imagined his past self in autobiographies and the like with the explicit goal of changing the direction of theoretical physics research and set new standards and virtues for the discipline.¹¹ Thus Einstein very explicitly invoked his role as persona to influence the practice of science. Pannekoek's more tacitly presumed persona had a significant impact on the way he believed the universe should be investigated and what its essential components were. Both cases illustrate that the persona, as an embodiment of epistemic virtues, is indissolubly linked to the daily practice of scholarly research. Obviously, this link leaves its marks on the knowledge produced.

The relation between the virtues of the socialist and astronomer: Anton Pannekoek

Pannekoek began his professional career as astronomer at Leiden University's Observatory, where he had also been educated. In 1906, at the invitation of

10 Jeroen van Dongen, *Einstein's Unification* (Cambridge 2010).

11 See e.g. Albert Einstein, 'Autobiographisches', in: P.A. Schilpp (ed.), *Albert Einstein: Philosopher-Scientist* (La Salle IL 1949) 1-94.

the Social Democratic Party of Germany (SPD), he chose to become a lecturer in historical materialism in Germany. He taught at *Partieschulen* in Berlin and Bremen and wrote for several Marxist journals and newspapers until the outbreak of World War I in 1914, when he returned to the Netherlands. In his teaching and publications Pannekoek defended an idiosyncratic anti-authoritarian brand of orthodox Marxism, famously inspiring Vladimir Lenin, who appointed him as one of the founders of the Amsterdam Bureau of the Communist International in 1920. This Bureau was short-lived however, as Pannekoek and several others of the Dutch Left clashed with Lenin and Karl Radek over the use of Bolshevik tactics in Western Europe. Pannekoek argued that these tactics might work in an underdeveloped country such as Russia, but that in the industrialised countries of Western Europe, with their well-established bourgeois classes, the revolution had to come from the workers themselves rather than from a small vanguard group.¹²

After his period as full-time socialist, Pannekoek returned to astronomy in 1919. The Dutch government prevented him from becoming assistant director of the Leiden Observatory because of his socialist convictions, but he was appointed lecturer at the University of Amsterdam (a municipal institution) and was given the task of founding an astronomical institute there.¹³ His research in Amsterdam focused on the structure of the Milky Way and the astrophysics of stellar atmospheres. For this work he was awarded an honorary doctorate by Harvard University in 1936 and the Gold Medal of the Royal Astronomical Society in 1951.

Of course Pannekoek never entirely dropped his activities in either political theorising or astronomy, even if his professional engagement was in the other field. Yet, as indicated, he always tried to keep his two professional careers strictly separated. This was reflected particularly in how he presented himself. He never identified himself as professional astronomer in his socialist writings, even when he wrote about subjects related to science. Conversely, he hardly ever mentioned his political preferences to his colleagues in science. For example, in 1943 Pannekoek began corresponding with the Belgian physicist Léon Rosenfeld and both were members of the *Verbond van Wetenschappelijke Onderzoekers* starting in 1946, but they only discovered their shared Marxist convictions as late as 1949, when Rosenfeld developed an

12 Schurer, 'Anton Pannekoek and the Origins'; Gerber, *Anton Pannekoek and the Socialism*, 142-150.

13 David Baneke, "'Hij kan toch moeilijk de sterren in de war schoppen.'" De afwijzing van Pannekoek als adjunct-directeur van de Leidse Sterrewacht in 1919', *Gewina. Tijdschrift voor de Geschiedenis der Geneeskunde, Natuurwetenschappen, Wiskunde en Techniek* 27 (2004) 1-13. Similar reservations almost

prevailed in the case of Albert Einstein, who was initially confused by the Dutch authorities with revolutionary art critic Carl Einstein; see Jeroen van Dongen, 'Mistaken Identity and Mirror Images: Albert and Carl Einstein, Leiden and Berlin, Relativity and Revolution', *Physics in Perspective* 14 (2012) 126-177 DOI 10.1007/s00016-012-0084-y.

interest in Pannekoek's historical writings.¹⁴ Even when Pannekoek wrote his biographical memoirs for his family during World War II, he produced two completely separate texts: one about his career in astronomy and another about his role in the labour movement.¹⁵

Yet despite Pannekoek's reluctance to reveal any relation between his activities, he does hint toward an intellectual connection between science and society:

Interaction existed in so far as that the method of natural science, which I had learned thoroughly, helped me discover in Marxism the science of society; and that has remained the basis of my work. That is why the theoretical foundations of the workers' struggle were my assigned task, which resulted in my contributions to the struggle over theoretical issues.¹⁶

The interaction to which Pannekoek alluded was not a guiding, metaphysical connection. Instead it was an internal epistemic one, which can be brought to light by looking at how he believed knowledge could be attained by either a Marxist or a scientific scholar, encoded in what Pannekoek here identified as a shared 'method'.

Astronomy

In astronomy Pannekoek often questioned theoretical presuppositions and emphasised the need for active interpretation and analysis by the astronomer.¹⁷ He invoked these virtues when assessing galaxy models, for example when rejecting the model of the Milky Way proposed by Jacobus Kapteyn from Groningen. This model, which Kapteyn worked on in the last two decades of his life, was one of the more widely accepted models of the galaxy in the early twentieth century.¹⁸ It represented the distribution of stars as a function of galactic latitude and distance, with the density of stars gradually decreasing with increasing distance from the centre of the stellar system.

In 1908 Kapteyn divided the entire night sky in three sections – the galactic poles, the galactic equator and the intermediate area between these

14 Anja Skaar Jakobsen, *Léon Rosenfeld: Physics, Philosophy, and Politics in the Twentieth Century* (Singapore 2012) especially 264.

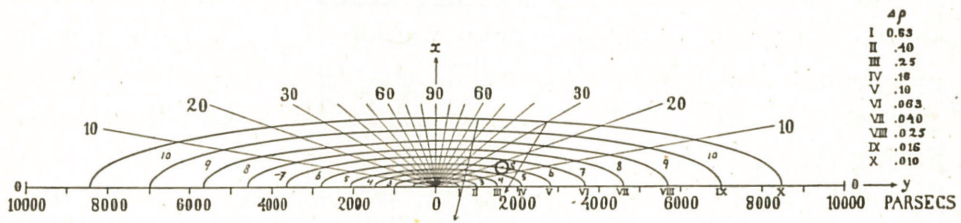
15 Anton Pannekoek, *Herinneringen* (Amsterdam 1982).

16 Pannekoek, *Herinneringen*, 16-17. Our translation from the Dutch original.

17 For a more detailed description of Pannekoek's astronomical research, see Chaokang Tai, 'Left

Radicalism and the Milky Way: Connecting the Scientific and Socialist Virtues of Anton Pannekoek', *Historical Studies in the Natural Sciences* 47:2 (forthcoming).

18 Robert W. Smith, *The Expanding Universe: Astronomy's 'Great Debate' 1900-1931* (Cambridge 1982) 56-59.



Kapteyn's final model of the galaxy, published in 1922. The half ellipses indicate areas of equal star density. The small circle right of the center indicates the location of the Sun in this model, which, according to Kapteyn's calculations, was at 650 parsec from the center.

Jacobus Kapteyn, 'First Attempt at a Theory of the Arrangement and Motion of the Sidereal System', *Astrophysical Journal* 55 (1922) 302-329, on 304.

two extremes. For each of these three sections he determined the number of stars as a function of their apparent magnitude. From that, he computed numerically the number of stars as a function of distance. He found that in all three sections the number of stars gradually decreased with increasing distance from the sun, and that this effect was much larger in the direction of the galactic poles than in the direction of the equator. This meant that the system was shaped as a flattened ellipsoid.¹⁹ In his final system of 1922, Kapteyn calculated the ellipsoid to be 18000 parsec²⁰ in diameter with a maximum vertical cross section of 2000 parsec (see above). The sun was only 650 parsec from the system's centre.²¹

Kapteyn's numerical methods have been praised for their inductive nature and for their reliance on observational data rather than on sophisticated mathematical analysis like those of many of his contemporaries.²² The failure of his model is often attributed to his neglect of interstellar absorption, the existence of which was generally accepted by the astronomy community only after 1930.²³ Kapteyn's model however, also received strong criticism before 1930. Heber D. Curtis for example, admired Kapteyn's methods but said that he could not 'as most astronomers do, fall

19 Jacobus C. Kapteyn, *On the Number of Stars of Determined Magnitude and Determined Galactic Latitude* (Groningen 1908).

20 'Parsec' is a standard distance unit in astronomy: 1 parsec is 3,26 lightyears, or $3,09 \times 10^{16}$ meter.

21 E. Robert Paul, *The Milky Way Galaxy and Statistical Cosmology, 1890-1924* (Cambridge 1993) 150-158; Jacobus C. Kapteyn, 'First Attempt at a Theory of the Arrangement and Motion of the Sidereal System', *Astrophysical Journal* 55 (1922) 302-328.

22 See, e.g., Adriaan Blaauw, 'Kapteyn, Jacobus Cornelius', in: Charles Coulston Gillespie (ed.), *Dictionary of Scientific Biography* 7 (New York 1973) 235-240; Elly Dekker, 'Jacobus Cornelius Kapteyn (1851-1922)', in: Adriaan Blaauw et al., *Sterrenkunde bekeken. Sterrenkunde aan de Groningse Universiteit vanaf 1614* (Groningen 1983) 31-42.

23 See, e.g., Pieter C. van der Kruit, *Jacobus Cornelius Kapteyn: Born Investigator of the Heavens* (Cham 2015) 567-568; Blaauw, 'Kapteyn'.

down and worship all the results which have come out of this mathematical mill'.²⁴ Pannekoek meanwhile, integrated Kapteyn's numerical methods into his own research, but used them to derive results that conflicted profoundly with Kapteyn's model of the galaxy.

Pannekoek's first statistical research was published in 1910.²⁵ In this paper he expressed the concern that Kapteyn had inadvertently presupposed an inherent overall symmetry in the distribution of stars. The consequence of this presupposition would have been that Kapteyn had thrown together large sections of the galaxy into a single function, which allowed no other result than the gradually thinning ellipsoid that he had found, and which indeed showed the symmetry initially assumed. Pannekoek argued that the visual appearance of the Milky Way, with its patchy light structure, completely contradicted such a symmetry. His solution was to focus on specific features of the Milky Way that stood out visually and determine the star distribution function for each of these features individually, while still using Kapteyn's numerical methods. In a first attempt Pannekoek focused on the galactic clouds in Aquila and Cygnus and found that, in these directions, the number of the faintest stars actually seemed to increase, rather than decrease as would be expected from Kapteyn's ellipsoid model.²⁶ Here we see a contrast between Kapteyn's and Pannekoek's way of working: where Kapteyn was led by a result that came out of his generalising inductive method, Pannekoek believed that such a result should be put to the test by comparing it to the visual appearance of the galaxy – even though it was subjective. Whether the end result was acceptable or not depended on the 'trained judgement' of the astronomer. This way of looking, of mixing the direct representation of data output with a more subjective intervention, was not unique to Pannekoek; in fact, it became more prominent through the first half of the twentieth century, accompanied by the persona of the skilled expert.²⁷

Another alternative to Kapteyn's model, developed by Pannekoek in 1924, was to take a three dimensional perspective on the star distribution. Instead of determining the star density as a function of only two dimensions, radial distance and galactic latitude, Pannekoek now also took into account galactic longitude. Just as important however, was the fact that his goal was not to find the structure of the entire system, like Kapteyn, but rather to search for the star clusters that were responsible for the individual features of the Milky Way's appearance. A very different picture of the galactic system emerged from these investigations. Pannekoek's galaxy was much more

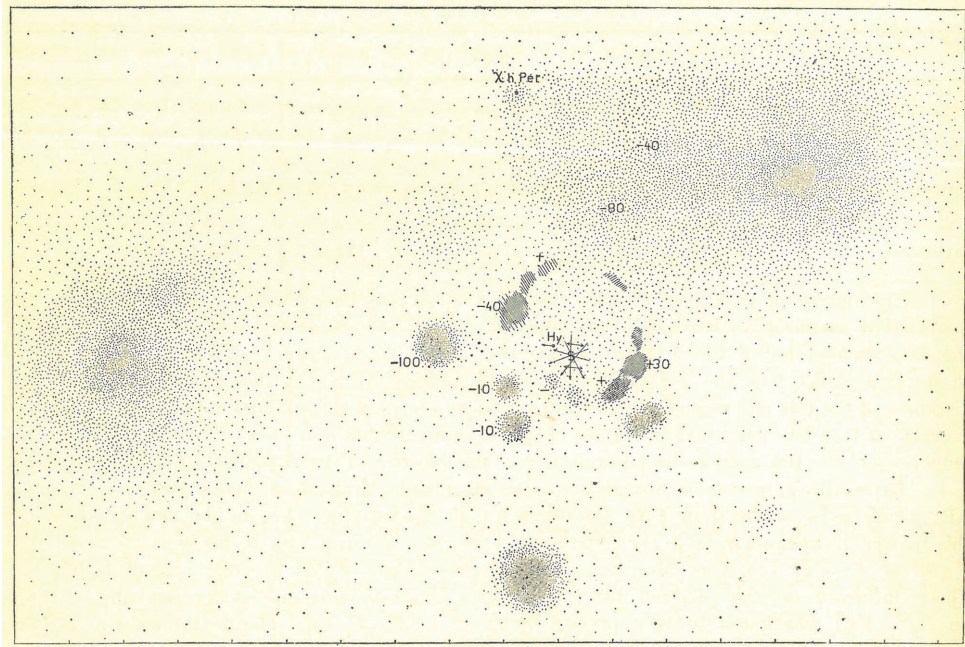
24 Smith, *Expanding Universe*, 85.

25 Anton Pannekoek, 'Onderzoekingen over den bouw van den Melkweg', *Verslag van de Gewone Vergaderingen der Wis- en Natuurkundige Afdeling*

der Koninklijke Akademie van Wetenschappen 19 (1910) 243-262.

26 *Ibid.*, 260-262.

27 On 'trained judgment', see Daston and Galison, *Objectivity*.



This diagram shows the star density of a cross section of a local section of the galactic plane. The diagram shows an area of 1750 by 1000 parsec. The numbers next to the clusters indicate how far they are positioned above or below the galactic plane.

Anton Pannekoek, *Researches on the Structure of the Universe: 1. The Local System deduced from the Durchmusterung Catalogues* (Amsterdam 1924) 114.

irregular than Kapteyn's smoothed-out ellipsoid. It was a loose collection of clusters and areas with few visible stars, without a clearly defined edge or superstructure.²⁸ See above for Pannekoek's representation of the part of the galaxy in the vicinity of the sun. The contrast between this bottom-up collection of particularities and Kapteyn's top-down model is obvious.

Although Pannekoek did not specify exact dimensions for his Milky Way system, nor gave a rough estimate of its size, he clearly did believe it to be substantially larger than Kapteyn's. Specifically, Pannekoek found that the clusters that formed the Aquila stream and the Cygnus cloud were at an enormous distance from the sun, at 60000 and 40000 parsec respectively, which was far beyond the outer limits of Kapteyn's system.²⁹ These results seemed to confirm the much larger galaxy model proposed a year earlier by the American astronomer Harlow Shapley upon determining the distances to globular star clusters. In this model, the sun was placed close to the edge, and not near the centre of our galaxy system. Kapteyn had rejected Shapley's

28 Anton Pannekoek, *Researches on the Structure of the Universe: 1. The Local Star System deduced from the Durchmusterung Catalogues* (Amsterdam 1924).

29 Anton Pannekoek, 'The Distance to the Milky Way', *Monthly Notices of the Royal Astronomical Society* 79 (1919) 500-507, especially 504.

system, as his results made it difficult to concede that the sun was placed far from the galaxy's centre.³⁰ Most members of the Dutch school of statistical astronomy followed him in that assessment, with the exception of Pannekoek, who preferred Shapley's galaxy in what became known as the 'Great Debate' on the size of universe.³¹

Crucially, the difference between Kapteyn and Pannekoek is not found in the statistical methods they used, or in the observational data that was available to them; in both cases Pannekoek borrowed substantially from Kapteyn. Instead, differences were due to what they considered to be the essential features of the galactic system – whether these were the individual star clusters or the overarching system – and at what point in the analysis these points of view were allowed to play a role. Such ontological concerns, as Daston and Galison have shown, can find their roots in epistemic virtues, reflected in the persona of the scientist. In the case of Pannekoek, the 'ideal' astronomer would have been able to invoke intuitively strong expert judgments to actively interpret, free from preconceived ideas, large numbers of direct observational data and mould these into meaningful features and structures. *Longue durée*, or 'mesoscopic', historiography has shown us that the intuitively judging expert came upon the heels of the detached objective experimenter.³² This is where our microscopic history connects to the larger story: Kapteyn preferred a more hands-off, impersonal method in which the procedures had to be set out in advance and followed to the letter, which was typical of the late nineteenth century virtue of mechanical objectivity. Yet the lack of interpretation during the analysis, so Pannekoek argued, allowed unwarranted theoretical presuppositions to become codified into the procedures with no way to filter them out at a later point. Thus blindly following his scheme had caused Kapteyn to find what he had implicitly assumed at the outset. At the same time however, Pannekoek's emphasis on avoiding bias of course is a strong marker of adherence to the objective method, while Kapteyn's apparent penchant for global symmetry reminds us of older virtues in which capturing the 'essence' of a natural phenomenon was considered crucial; as always, different elements of 'meso' are mixed in at the level of the micro: individuals might harbour several larger epistemic developments in their personal methodologies, even though the cases of Pannekoek and Kapteyn illustrate the overall development well, just as the latter helps us in placing their differences in the contingencies of the period.

30 Owen Gingerich, 'Kapteyn, Shapley, and their Universes', in: Piet C. van der Kruit and Klaas van Berkel (eds.), *The Legacy of J.C. Kapteyn: Studies on Kapteyn and the Development of Modern Astronomy* (Dordrecht 2000) 191-212, 201.

31 E. Robert Paul, 'The Death of a Research Programme: Kapteyn and the Dutch Astronomical Community', *Journal for the History of Astronomy* 12 (1981) 77-94, especially 83; Smith, *The Expanding Universe*.

32 Daston and Galison, *Objectivity*.

Clearly and crucially, different methodologies relate to different epistemic virtues, and vice versa. Furthermore, the rejection of a certain method could go hand in hand with the rejection of a persona, as illustrated by the assessment of Pannekoek and his approach to astronomy by Pieter van Rhijn, one of Kapteyn's students and his eventual successor in Groningen. When graduate student Bart Bok submitted his PhD thesis on the η Carinae region to Van Rhijn, the latter initially dismissed it because it focused only on a single region in the sky, rather than multiple regions distributed equally over galactic longitude: 'it's the sort of thing that that man Pannekoek would do.'³³

Marxism

In his Marxist writings, Pannekoek stressed that historical materialism should be considered a scientific method rather than a fixed and certain theory for the development of society. Indeed, Pannekoek used the terms 'historical materialism', 'social science' and 'Marxism' interchangeably. The method of Marxism entailed explaining historical occurrences and social developments by searching for their material causes. It was similar to natural science, or 'mechanical materialism', in that the goal for both was to provide economy of thought by combining vast amounts of information and abstracting this information into simple, comprehensible laws.³⁴ It deviated from natural science primarily in its subject matter. Where natural science investigates the physical world and could reduce the entire world to the deterministic movement of particles, Marxism had to take into account social and mental factors as well in order to explain the social world.³⁵

Because Pannekoek considered Marxism to be a science he argued that the results it produced were only temporary truths that could be challenged and should be re-evaluated as circumstances change. For him, the great contribution of Karl Marx was the method of historical materialism, not necessarily the results he obtained using this method. His emphasis on following the method, rather than the letter of the writings of Marx and Friedrich Engels, is exemplified by Pannekoek's debate with Karl Kautsky over the role of parliamentarianism and mass actions in bringing forth the proletarian revolution. Towards the end of the debate he charged Kautsky with appealing

33 American Institute of Physics, Niels Bohr Library & Archives, Bart Bok, interview with David DeVorkin, session 1, 15 May 1978, www.aip.org/history-programs/niels-bohr-library/oralhistories/4518-1 (13 May 2016).

34 Gerber, *Anton Pannekoek and the Socialism*, 21-27; Anton Pannekoek, 'Das Wesen des Naturgesetzes', *Erkenntnis* 3 (1932) 389-400.

35 Anton Pannekoek, 'Twee natuurwetenschappers in de maatschappelijk-geestelijke strijd', *De Nieuwe Tijd* 22 (1917) 300-314, 375-392.

simplicistically to authority by extensively quoting directly from Marx and Engels; he himself, on the other hand, had completely internalised this 'new science' and applied it with an appropriate suppleness of mind and method.³⁶

Even more influential than Marx for the socialist thought of Pannekoek was the work of Joseph Dietzgen, a German autodidact philosopher whom Marx and Engels had credited with independently discovering the dialectic method and identified as 'the philosopher of the proletariat'.³⁷ There was much debate on the relation between the work of Marx and Dietzgen in the early twentieth century. Contrary to other Marxist thinkers such as Georgi Plekhanov and Ernest Unterman, Pannekoek did not believe that there was a contradiction between Marx and Dietzgen. Instead he argued that they were complementary in a crucial way: while Marx provided the science of society, Dietzgen provided the theory of the human mind. The former explained that consciousness was determined by social factors, the latter explained how this happened.³⁸ Pannekoek praised Dietzgen for rising above earlier philosophers by providing a testable hypothesis on the workings of the mind, rather than claiming to hold the absolute truth about the nature of the mind. His work represented 'a scientific continuation of former philosoph(ies), just as astronomy is the continuation of astrology and of the Pythagorean fantasies, and chemistry the continuation of alchemy'.³⁹ According to Pannekoek's interpretation of Dietzgen, the human brain was simply an organ that had evolved in such a way that it was particularly suited for a specific task: to mediate the overwhelming stream of information received by the senses. The mind ordered this information into neat abstract concepts that could easily be comprehended, providing economy of thought.⁴⁰ Crucially, the mind worked instinctively and intuitively; its analytical and abstracting abilities could not be avoided. Furthermore, the human mind was influenced by any form of information that entered the senses, regardless of whether this information had any independent existence outside of it. Thus its input was not limited to sounds and sights, but also included manmade constructions like economic relations, social circumstances and philosophical world views. The Marxist should then investigate the social and economic factors that influence the thoughts of man on the one hand, and explore how thoughts and actions in turn influence the developments of society on the other.⁴¹

36 Gerber, *Anton Pannekoek and the Socialism*, 77.

37 Anton Pannekoek, 'De filosofie van Kant en het Marxisme', *De Nieuwe Tijd* 6 (1901) 549-564, 605-620, 669-688, quoted on 620.

38 Anton Pannekoek, 'Dietzgenismus und Marxismus', *Bremer Bürgerzeitung*, 12 November 1910.

39 Anton Pannekoek, 'The Position and Significance of J. Dietzgen's Philosophical Works',

introduction to: Joseph Dietzgen, *The Positive Outcome of Philosophy*, translated by Ernest Untermann (Chicago 1906) 7-37, 30.

40 Anton Pannekoek, 'Dietzgens Werk', *Die Neue Zeit* 31 (1913) 37-47.

41 Anton Pannekoek, 'Society and Mind in Marxian Philosophy', *Science and Society* 4 (1937) 445-453.

Pannekoek's emphasis on Marxism as a scientific method is important. First, as said earlier, of course it suggests a direct relation between his science and social theorising. Second, it suggests that one has to differentiate between Marxists, who conduct research into society and the members of the working class who will be responsible for actually changing society. According to Pannekoek, the sole responsibility for initiating and leading the revolution should lie with the latter group. Once the workers had found the right revolutionary spirit, they would organise themselves and through spontaneous mass actions slowly weaken the foundation of the existing state. When this finally collapsed the working class would create a new, truly democratic society that was organised according to the principles and methods that they had developed as they lived through the struggle.⁴²

Since the new society had to be developed by the workers themselves, the Marxist scholar had to play a part on the side-lines. It was important that he did not get too involved in the practical business of the revolution. Instead his task was to educate the workers and help them understand why they took certain courses of action. He had to analyse the revolution as it happened, initiated by workers themselves from 'bottom up'. At the same time, he should offer synthesising insight into whether the revolution was taking the right direction, but without any theoretical presuppositions, as an open-minded yet trained expert, so to speak.

Crucially, it was not the Marxist's task to organise the workers either by forming trade unions or by creating a socialist party. Trade unions and parliamentarianism could provide short-term benefits for the workers, but ultimately pacified them and weakened their revolutionary spirit. Furthermore, it caused them to rely on pre-existing leadership rather than attempting to develop their own ways of organising. Pannekoek's rejection of parliamentary tactics was the main reason he clashed with party leaders such as Pieter Jelles Troelstra in the Netherlands and Kautsky in Germany. Nor did Pannekoek believe that Marxists could bring about the socialist revolution by way of a small elitist vanguard group, like the Bolsheviks had done in Russia, or by acts of terrorism. Although these tactics might help ignite the revolutionary spirits of the workers and weaken the structure of the existing state, ultimately they too, would cause the workers to rely on the leadership of a small group of Marxists.⁴³

Pannekoek's ideal of the Marxist persona as a detached scholar led him to play a passive role in the labour movement. Even in Germany during his most active period he only wrote opinion pieces and taught historical materialism.

42 Gerber, *Anton Pannekoek and the Socialism*, 95-99.

43 For Pannekoek's criticism of Bolshevik tactics in Western Europe, see: Anton Pannekoek, 'World Revolution and Communist Tactics', in: D.A. Smart, *Pannekoek and Gorter's Marxism* (London

1978). For his criticism of terrorism, see: Anton Pannekoek, 'Friedrich Adler', *De Nieuwe Tijd* 21 (1916), which discusses the assassination of Count Karl von Stürgkh by Marxist physicist Friedrich Adler.

From the 1920s onwards, Pannekoek was no longer a member of any socialist organisation and worked full-time as astronomer in Amsterdam. During this later period, he focused solely on writing theoretical and philosophical articles on the nature of historical materialism. Although his retreat into theory was partially the result of his isolation from the working class, the fear of influencing the revolutionary spirit of the workers would no doubt also have played an important role. Unsurprisingly, his analytic yet expectantly observant and academic persona was a vulnerable point for attacks by his opponents. He became known as a perpetual critic who lacked political pragmatism, a utopian and a star-gazer with his head in the clouds, whose only concern was 'poking around with a little stick in the gutter of theory.'⁴⁴ Pannekoek's lack of pragmatism ultimately led him to be isolated from the working class completely. His further theoretical development stalled and he eventually ended up dogmatically defending the methodology of orthodox Marxism.⁴⁵

Conclusion

In the introduction we have suggested two advantages of focusing on the ideal scholarly persona and its associated epistemic virtues. First, it promised to bridge the gap between 'microscopic' and 'mesoscopic' historiography, and indeed our investigation of Pannekoek's astronomy fits the mesoscopic history of Daston and Galison very well. The resemblances between their description of the rise of trained judgement in the early twentieth century and Pannekoek's emphasis on interpretation, analysis and human judgement are striking. These similarities help us to situate the methodological differences between Kapteyn and Pannekoek within the broader development in epistemic virtues throughout the period. At the same time, we showed some of the limitations of the applicability of Daston and Galison's categories to explain the choices of the individual, as neither Pannekoek's nor Kapteyn's approaches fall exclusively within the prescriptions of either the virtue of trained judgement or mechanical objectivity.

The second advantage was the possibility to cross disciplinary boundaries and enable an integrated perspective on the astronomical and Marxist personae of Pannekoek. When comparing Pannekoek's astronomical

44 Boekelman, *The Development of the Social and Political Thought*, 360-362; Bricianer, *Pannekoek and the Workers' Councils*, 35-36. The quote ('hij zit met een stokje in het gootje van de theorie te peuteren') is Willem van Ravesteyn's, one of the founders of the Communist Party in the Netherlands, as in Dirk Struik, 'Mijn socialistiese

jaren in Nederland. Herinneringen uit 1914-1924', in: Jacques Giele et al. (eds.), *Jaarboek voor de geschiedenis van socialisme en arbeidersbeweging in Nederland 1977* (Nijmegen 1977) 191-246, 221.

45 Bart van der Steen, 'Anton Pannekoek en het Orthodoxe Marxisme', *Vlaams Marxistisch Tijdschrift* 40 (2006) 73-82.

persona and his Marxist persona, certain connections do become visible. For both the main task was to organise and make sense of an overwhelming input of direct information, bottom up so to speak, and abstract it into comprehensible laws and explanations. In this sense both personae are notably required to be active and synthesising observers. At the same time, it is essential for both personae to be free from theoretical preconceptions. Predetermined ideas, whether they are about the shape of the galaxy or the proper way to organise society, clouded the judgement of the astronomer as much as the judgement of the Marxist; they would lead him in the direction that had already been anticipated from the outset.

The coherence between these ideals for both of Pannekoek's disciplines becomes even clearer when we turn to his theoretical beliefs about the human mind, which entailed essentially the same epistemic positions for both scientists and Marxists. Both the astronomer and the Marxist had to make use of the inherent powerful advantage of human physiology – the analytical ability of the mind. At the same time, Pannekoek was wary of the fact that the human mind worked instinctively and involuntarily, which meant that its generalising and distinguishing tendencies could not be avoided. What mattered then, was to put this quality of the mind to good use while avoiding its potentially distorting qualities. The attainment of that epistemic position of course, required discipline – discipline to train one's faculty of judgment and discipline when applying it. Pannekoek's insistence on disciplining the mind is reflected in his warnings of allowing preconceived ideas to play a role, whether these applied to the shape of the galaxy or the proper way to organise workers and initiate the socialist revolutions. Any preconceived idea could nestle in the mind of the scholar, cloud his judgement and lead him to see what he expected to see from the outset. What in isolation appear to be idiosyncratic methodologies can thus be interpreted as natural consequences of ways to shape the scientific self, to counteract the weaknesses of the self and optimally utilise its epistemic abilities.

Chaokang Tai (1984) is a PhD candidate in the history of science at the University of Amsterdam. He is affiliated to the Vossius Center for the History of Humanities and Sciences (University of Amsterdam) and the Descartes Centre for the History and Philosophy of the Sciences and Humanities (Utrecht University). His research focuses on the science and life of Anton Pannekoek. Email: c.k.tai@uva.nl.

Jeroen van Dongen (1974) is professor of the History of Science at the University of Amsterdam and co-director of the Vossius Center for History of Humanities and Sciences. He is a former Editor of the Einstein Papers Project (California Institute of Technology); his main publications include *Cold War Science and the Transatlantic Circulation of Knowledge* (Leiden 2015) and *Einstein's Unification* (Cambridge 2010). Email: j.a.e.f.vandongen@uva.nl.