

Abstracts for the conference:

## **Anton Pannekoek (1873-1960): Ways of Viewing Science and Society**

### **Gerard Alberts**

Korteweg-de Vries Institute for Mathematics, University of Amsterdam

#### **Scientific and societal aspirations in the career of Dirk Struik**

Dirk Struik's (1894-2000) engendered societal aspirations in a quite natural way took shape as political ambitions. Mathematics, scientific thought in general, conveyed for him a deeper layer of emancipation through the enlightenment of human existence. At the outset the two did not mingle. Society was a theme, an object of change and a field of aspiration. Mathematics, by contrast, was hardly thematized. It was a constant of culture; its spread a vehicle of emancipation. To Struik personally it offered a vehicle of social mobility. After finishing his studies of mathematics in Leiden, he was a highschool teacher. In full awareness he entered a tier of society to which his father never had acquired access. Being induced to academia for research brought him a mobility he never even dreamt of.

In his twenties, academic professional and political semi-professional in the socialist movement, Dirk Struik, much like Anton Pannekoek, kept his two realms of activity strictly separate. Gerrit Mannoury's combination of mathematical thought and communism did not appeal to him as a viable route to follow.

Popularization was the way to make mathematics exert its emancipatory powers and a good narrative was the apt form, a good historical narrative in particular. Struik's explorations of the history of mathematics accompanying his mathematics form early on in his career are good storytelling; they show strong rhetorics and, for a marxist, surprisingly little dialectics.

Later, in the 1930s, mathematical thought did become a theme of reflection. Whether by the influence of Boris Hessen or of Robert Merton, Struik began to view mathematics as a cultural practice influenced by the forces guiding the development of society. In his essay 'On the sociology of mathematics' he explicitly turned this new view into a program for historical research.

Two views on mathematics competing for priority in Struik's intellectual endeavours curiously resulted in simultaneous publication in 1948 of his two most characteristic books, *Yankee Science in the Making* and *A concise history of mathematics*, the first genuinely combining his dialectics and mathematics, the other keeping them strictly apart.

### **David Baneke**

Descartes Centre for the History and Philosophy of the Sciences and the Humanities, Utrecht University

#### **Pannekoek's one revolution: Dutch astronomy 1900-1940**

In 1905, Pannekoek left his first love, astronomy, to pursue his second one, socialist theory. He was still fascinated by astronomy, but he was deeply disappointed by the way it was done at Leiden observatory – or rather not done, as he described in his memoirs. When his 'literary activities', as he sometimes referred to his political work, were interrupted by the First World War, he returned to astronomy and to the Netherlands. Shortly after, things started to change in the Dutch astronomical community. By the 1920s, it was a small but very active scientific community, featuring prominent researchers such as De Sitter, Hertzprung, Oort, Minnaert, and Pannekoek himself. Through their

work and, especially, through their students, they had a significant influence on astronomy in the twentieth century.

Pannekoek contributed to these changes perhaps the only real revolution he was involved in. He was an unlikely candidate, however. After his failed appointment in Leiden, he was appointed as the only professional astronomer at the University of Amsterdam, with no telescopes or other facilities, and hardly any students - hardly a position of influence. In my talk, I will analyze his contributions to the new ways of doing research, of teaching astronomy and of organizing the discipline in the Netherlands in the Interwar period.

#### **Klaas van Berkel**

Research Centre for Historical Studies, University of Groningen

#### **Utopianism in Science and Politics: the Common Ground between Anton Pannekoek's Astronomical and Socialist Identities**

The fact that Anton Pannekoek wrote two separate autobiographies, the one describing his life in astronomy, the other describing his political activities, has puzzled scholars and scientists since these two autobiographies were first published. This double identity however has to be seen as a historical construct, in need of an explanation. In my presentation I will try to identify the events that led Pannekoek to separate the two hemispheres of his mind so sharply and then explore the possibilities for finding a common ground hidden beneath Pannekoek's two identities. More specifically, I will look into late nineteenth century utopianism and the corresponding longing for purity as a possible source of inspiration for Pannekoek's work in science and politics.

#### **Jeroen van Dongen**

Institute for Theoretical Physics, University of Amsterdam

#### **Einstein, Pannekoek, Einstein: anti-revolutionary resentment and the resistance to modernism**

In 1919, Anton Pannekoek was blocked by the Dutch government from becoming adjunct-director of the Leiden Observatory due to his political stances. One year later, Albert Einstein's appointment as extra-ordinary professor at the same university nearly faced the same fate. Einstein, however, had been confused with famed and feared radical modernist art critic Carl Einstein. At the same time, his new science faced vocal opposition due to its perceived revolutionary nature by a newly assembled anti-relativist "Arbeitsgemeinschaft". This 'society' wished to combat Einstein's "scientific Dadaism". In this presentation, we follow the intertwining paths of Einstein, Pannekoek and Einstein. This will reveal the close links between resistance to modernism in the arts and sciences and resentment regarding the European revolutions of the late 1910s.

#### **Johan Hartle**

Karlsruhe University of Arts and Design

#### **Cosmos and utopia between progressivism and intangibility.**

In enlightened contexts outer space often represents a secularized version of theological figures of thought. Kant's famous "der bestirnte Himmel über mir"—which at the same time stands for the regulative idea of totality, non-representable under the categories of understanding—is a classical example hereof.

In the socialist tradition references to astronomy and the cosmic order are generally of two kinds. Firstly, the progressivist narrative (particularly developed in the Russian avant-garde and the Bolshevik movement) aims to conquer outer space and make it available for the construction of a

new cosmos. In this narrative, the conquered cosmos appears as an extended field of communist politics. The so-called Biocosmists and, of course, Aleksander Bogdanov's novel *Red Star* are characterized by precisely this optimism. As part of a broader cultural and ideological context, it also contained the idea of transforming immortality into spatial infinity.

Secondly, in the tradition of Western Marxism, critical of these types of progressivist narratives, references to astronomical constellations often allude to utopian figures of intangibility. Famously Walter Benjamin's conception of 'constellation' and its aftermath (in the thought of Adorno and Agamben) represents such a tradition. For Benjamin, constellations were inspired by the enigma of the stars, thus representing a methodological ethos to keep things at distance, with a certain sense of melancholy implied.

My talk aims to reconstruct these two lines of tradition within the general framework of conceptualizations of utopia. It will thus aim to develop a thesis about the intrinsic link between astronomy and emancipation.

### **Edward van den Heuvel**

Anton Pannekoek Institute for Astronomy, University of Amsterdam

### **Anton Pannekoek, astronomer and communist, his astronomical work and how Amsterdam got its Astronomical Institute**

An overview is given of Pannekoek's life as an astronomer. In his highschool days he started as an amateur, while his interest in astronomy often competed with his interest in biology. Both fields remained his love throughout his life. He studied in Leiden and was appointed in the permanent staff of Leiden Observatory. After an 8-year break (1906-1914), when he worked as a leading Marxist theorist for the German Social Democrat Party, he returned to astronomy and was appointed in 1919 at the University of Amsterdam, after the Prime Minister had personally blocked his appointment as professor at Leiden State University. In Amsterdam, where half of his appointment was to lecture in astronomy, the other half in mathematics, he continued his studies of the Milky Way, since the 1890s one of his favored research topics. In 1921 he founded the Astronomical Institute which since 1982 carries his name. In the 1920s he became also interested in solar and stellar spectroscopy. He mastered the atomic physics (quantum mechanics) required for understanding atomic spectra and was the first to construct numerical models of the structure of stellar atmospheres, required for understanding how the absorption lines in stellar spectra are formed. Throughout his life he also had a great interest in how astronomy has developed since the earliest times – in Egypt, Babylon and Greece – and how this development of science was intertwined with the development of society. This interest led after his retirement to writing of his beautiful book on "The History of Astronomy".

### **Alex de Jong & Joost Kircz**

International Institute for Research and Education Amsterdam

### **Pannekoek and the missing subjective factor**

Anton Pannekoek's philosophy was clearly positivist. For him, the experience was leading, with new phenomena demanding new theory. Hence, he easily adopted the General Relativity Theory in his astronomical works. On the same footing, he saw Marxism as the supposed correct scientific theory for understanding social developments. However, in this case he rigorously kept the idea that social change is almost linearly dependent on development of the social-economical basis. Because of this, he accepted the Russian revolution as a necessary and inevitable step towards a bourgeois state. In the same vein, he considered his own role, and the role of marxist intellectuals in general, as purely analytic and educational. Pannekoek believed the working class will develop a socialist consciousness

as capitalist development runs out of steam. In his political work the idea of a possible rebound to barbarism, or the role of the individual in history, had no place. Here, there is no dialectical interaction between the objective social-economical basis and the subjective human striving for emancipation. This paper examines Pannekoek's objectivist interpretation of marxism.

**Bart Karstens**

University of Amsterdam

### **Anton Pannekoek as a Pioneer in the Sociology of Knowledge**

One of Pannekoek's leading ideas was that changes in societal structure lead to changes in the way people think. Thus, if a society could be optimally structured this would lead to optimal thinking as well. This way of reasoning begs a significant question: if only in already good societies a theory of optimizing societies can develop, how can we explain the apparently unconscious historical process leading up to the emergence of good societies? The theory of the civilizing process (Norbert Elias) may provide an answer to this question. It turns out that interesting parallels between Pannekoek and Elias' sociology of knowledge can be drawn. Next to this Pannekoek also contributed to historiography of science, which was approvingly cited by proponents of the strong programme in the sociology of scientific knowledge. Again a parallel between the work of Pannekoek and later sociologists presents itself. The aim of my talk is to establish by comparison how we should understand Pannekoek as a precursor to the sociology of knowledge of the 20th century.

**Alexei Kojevnikov**

Department of History, University of British Columbia, Vancouver, Canada

### **Universe in Upheaval: Relativistic Cosmology in the Context of the Russian Revolution**

Like other landmark historical upheavals, the drama and trauma of the Russian revolution engendered rich and often non-trivial entanglements between radical politics, modern science, and avant-garde art. In this paper I will examine the receptions of and responses to the general theory of relativity and the new relativistic cosmology of Einstein and de Sitter in the context of the revolutionary conflict and the civil war in Russia. Due to the almost total breakdown of international communications, these scientific news arrived in Petrograd with a few years delay, by the end of 1920. The possibilities for receiving scientific news from Russia in Europe at the time were also severely limited – mostly to personal communications via Paul Ehrenfest in Leiden. Through this channel arrived the most important Russian contribution to relativistic cosmology: Alexander Friedman's 1922 radical proposal of the Big Bang theory, in which the Universe was allowed to expand, contract, collapse and be reborn in an explosive scenario. Like Pannekoek, Friedman kept his science apart from his politics and avoided making any references to the political situation in his short mathematical paper. The connection, however, can be established if one juxtaposes his calculations with other imaginative perceptions of the Universe – scientific, artistic, and philosophical – expressed by his contemporaries in revolutionary Russian society.

**Sven Lütticken**

VU University Amsterdam

### **Council Aestheticism? Pannekoek, the Avant-Garde and Contemporary Art**

This lecture will trace "Pannekoekian" or, more broadly, left communist impulses in twentieth and twenty-first century aesthetic practice. Going beyond a model that sees artistic avant-gardes as being somewhat passively "influenced by" master thinkers, I instead aim to show how avant-garde artist-activists actively responded to the thought of Pannekoek and other left and council communists, and

at times participated in the same organizations. These responses could develop a significant degree of autonomy, especially from the 1960s onwards.

I will relate Pannekoek's insistence on new forms of struggle and on Marxism as action to avant-garde activity in the wake of World War I, during the 1960s and 1970s and in the present. Since, for Pannekoek, forms of action beyond and against the Party model should culminate in the creation of councils, I will also examine the repercussions of the councilist idea. Which specific articulation was given to council communism by avant-garde artists (or, in the case of certain Situationists, avant-garde anti-artists, whose critique of capitalism did however retain a distinctly aesthetic stance)?

Finally, the outlook will be broadened in a closing section titled "Can Dialectical Monism Break Bricks?," in which Pannekoek and his particular use of Joseph Dietzgen are positioned against McKenzie Wark's disparagement of Dietzgen in the name of Bogdanov's tectonics. Again placing Pannekoek in conjunction with contemporary art, I will argue that Pannekoek's form of dialectical materialism provides productive pointers for thinking and acting under anthropocenic conditions.

### **Paul Mattick**

Department of Philosophy, Adelphi University, New York, USA

### **Socialism, Art, and Science in the work of Otto Neurath**

The Austrian polymath Otto Neurath is today best known for his activities as organizer and propagandist for the Vienna Circle of logical empiricists. He is less well known as the force behind the development of the ISOTYPE method for the visual display of statistical information, and his activity as an economic planner in connection with the Bavarian revolutionary Council Republic of 1919 is almost completely forgotten. For Neurath, however, these three areas of activity were intimately connected: the "scientific world-conception" for which he campaigned as a positivist implied the necessity for a rational reconstruction of society and demanded that that reconstruction be carried out democratically; democratic social action required decision-making by a population informed of the facts even in the face of a lack of formal education; it was for the solution to this problem that Neurath enlisted the help of council-communist artists, members of the Cologne Progressive group. My presentation will explore this rich and rewarding set of interconnections.

### **Omar Nasim**

School of History, University of Kent, UK

### **Varieties of the Act of Drawing in Astronomy**

This talk will provide a general survey of the ways in which different forms of drawing have operated in the history of astronomy. Using a range of cases from different periods, we will explore the many ways in which the acts of seeing, knowing and drawing have operated together for the benefit of the observer. Of particular interest will be the role played by procedures, communication, and notebooks in these operations. But also of interest will be the role played by handmade drawings in the context of photography. The primary goal will be to detail the uses of drawing in the history of astronomy in order to help frame the graphical work of Anton Pannekoek.

### **Daniela de Paulis**

Amsterdam School for Cultural Analysis, University of Amsterdam

### **A Thought Experiment on Mind and Matter in Contemporary Cosmology**

The mapping of the Milky Way is still in the making: as our knowledge of the universe expands, so the limits of our enquiry. The pioneering mapping of the Milky Way as carried by optical astronomers

such as Anton Pannekoek in the early 1900, has been complemented later in the century by the discovery of the electromagnetic spectrum, together with the development of increasingly sophisticated optical observatories.

As cosmology research becomes increasingly technology based, the historical figure of the astronomer as the mediator between scientific theory and practice is replaced by that of an international research team composed by researchers with different expertise.

Pannekoek envisioned the natural world as the direct object of enquiry of the human mind, he did not presume an antagonism between the material world and the mind, rather he thought of mind and matter as a continuum: in his view, scientific laws did not exist per se, instead they were the result of a process of abstraction by the human mind in its attempt to understand natural phenomena as perceived by the senses. In his bottom-up approach, Pannekoek conceived scientific laws as human made tools for society to use in order to make sense of the surrounding world and act accordingly. His non-dualist view on science opposed the bourgeois materialistic view of the time, for which everything in the world is reduced to the movement of particles and for which natural laws are above human scopes. By looking at the legacy of Anton Pannekoek as scientist and humanist in this moment in history characterized by technology mediated science, a few questions arise of how can the human mind - the mind of the scientist and the mind of society in general - appropriate the notion of a material world which is discovered through the study of its

## **Annemarie Rullens**

### **Engineering society: the birth of technocracy: Science through the eyes of Willem Bonger**

Science has played a decisive role in political life throughout the twentieth century. After the devastating Second World War, Western Europe was rebuilt on the basis of science, even more so on Keynes's economic and political ideas. In the Netherlands, the sciences were part of social democratic politics already before the outbreak of the war. In the 1930s, Jan Tinbergen and Hein Vos used science to find a way out of the economic crisis of the time, the result of which was *Het Plan van de Arbeid* (1935), the Dutch manifesto of *plan socialism*. Tinbergen and Vos were however not the first scientists to influence the political course of the Sociaal-Democratische Arbeiderspartij (SDAP). When the first scientific journal of the socialist party, *De Socialistische Gids*, was established in 1916, intellectual work became officially recognized as an element of political life. Under the leadership of Willem Bonger (1876-1940) *De Socialistische Gids* became an influential intellectual forum in the SDAP. Bonger was an internationally acclaimed criminologist and from 1916 until 1938 editor in chief of *De Socialistische Gids*. He was a strong advocate of applied sciences and went so far as to claim that if the SDAP did not engage in scientific research, the party would suffer for it. Bonger did not only stress the importance of science, he expressed a very particular idea of science and its purpose for the SDAP and society at large. In doing so, he distinguished himself from other political scientists in the SDAP such as his contemporary Anton Pannekoek (1873-1960).

This paper aims to compare the understanding of science of these two contemporaries. Bonger is presented as an engineer of technocracy and Pannekoek as a pontiff of Marx. Whereas Pannekoek sought to popularize Marxism, Bonger developed a much more practical and pragmatic view of science. Both his academic and political writings express a strong belief in the malleability of society. Bonger did not primarily seek to reflect on society, he wanted to *make* a socialist society. He believed in the establishment of a socialist society and class struggle but intended to work towards this society by applying scientific knowledge. He dismissed a socialist revolution. He proclaimed socialism as 'een toegepaste wetenschap'. Applied sciences were a core element of his ideological socialist framework. The dominance of beta-sciences in the journal is striking, especially compared to the journal De

Nieuwe Tijd that served as an intellectual forum for Pannekoek and other socialist thinkers and mainly focused on philosophical debate, historical research and literary critiques.

In this paper some of Bonger's political and academic writings will be explored in order to show how his worldview combined science and politics. This paper demonstrates that Bonger is an interesting contemporary of Pannekoek because his thinking was an essential link between Pannekoek's Marxism and the social democracy of the postwar years which was dominated by het *plan socialism*.

### **Eric-John Russell**

Centre for Research in Modern European Philosophy, Kingston University, London, UK

#### **Dialectic in the Hands of a *Handwerker***

In his introduction to the collection of Joseph Dietzgen's essays, Anton Pannekoek wrote that "[i]t is the merit of Dietzgen to have raised philosophy to the position of the natural science, the same as Marx did with history." Pannekoek lauded Dietzgen's epistemology for allegedly being both materialist and dialectical in its investigation of the faculty of human understanding. My paper will proceed however by problematizing the status of the dialectic within what ought to instead be described as Dietzgen's inductive empiricism. The first question I will pose is therefore whether or not Marx's materialism ought be conflated with Dietzgen's empiricism, a position implicitly at issue within Pannekoek's veneration. Secondly, in seeking to establish a theory of human thought structured through the methods of the natural sciences, an additional difficulty emerges within Dietzgen's approach insofar as the stringency of a scientific method and its laws of necessity do not accord with human thought per se. Said another way, the facticity of science, along with an absolutized separation between the true and false, is not a mode of conceptual organization that reigns within thinking. The stakes of conflating materialism with empiricism and of rendering the dialectical method into a universal methodology on par with the methods of the natural sciences are each theoretical endeavors that wield strong implications for how one comes to understand capitalism and class struggle. After having demonstrated Dietzgen's lack of an adequately mediated historical and materialist approach to epistemology, my paper will thereby conclude by examining how it is that these methodological shortcomings bear ramification for Pannekoek's views on communism and class struggle.

### **Robert Smith**

Department of History and Classics, University of Alberta, Edmonton, Canada

#### **Across the divide: From the one galaxy universe to the expanding universe**

Astronomical thinking on the large-scale nature of the universe was transformed during the lifetime of Anton Pannekoek. Astronomers in the late nineteenth century and at the start of the twentieth century were little interested in the broader universe, its history and what lay beyond our galactic system. Some were very concerned with the structure of our own stellar system, but astronomers played next to no part in debates at the end of the nineteenth century about the wider nature of the cosmos. The infinite universe beyond our stellar system was territory professional astronomers were happy to leave to mathematicians, physicists, philosophers, and some popularizers. In this paper I will examine these attitudes and why and how they changed during the first decades of the twentieth century. In so doing I will argue that to understand these changes it's necessary to take into account radical institutional, social and technical changes too.

**Bart van der Steen**

Institute for History, Leiden University

**From Politics to Science? Pannekoek's Political Views on the Role and Nature of Science**

Ever since Friedrich Engels published his *Socialism: Utopian and Scientific*, Marxists have held that their socialism was a scientific one. But although the difference between the two strands of socialism was clear, Engels's pamphlet did not specify how science was to be defined and how it would influence politics, if at all.

Biographers of Anton Pannekoek have traditionally made a sharp distinction between his political activities and his scientific work – focusing their research on one of the two fields. In this, they seemed to take cue from Pannekoek himself, who wrote two autobiographies, focusing on his political and scientific career respectively. Departing from the assumption that, in fact, Pannekoek's political choices and scientific methods were interrelated and influenced each other, a number of presentations during this conference aim to ascertain in which ways – and to what extent – Pannekoek's scientific views informed his political choices.

The following paper aims to tackle the issue from another angle, and analyzes how Pannekoek discussed science in his political interventions and how his political allies were influenced by Pannekoek's views on science. In doing so, the paper focuses on Pannekoek's social democratic phase and his council communist phase. From a close reading of Pannekoek's political writings, his political views on the nature and role of science in society will be analyzed. Furthermore, the paper asks how Pannekoek's political allies discussed his (popular) scientific works.

**Chaokang Tai**

Institute for Theoretical Physics, University of Amsterdam; Descartes Centre for the History and Philosophy of the Sciences and the Humanities, Utrecht University

**How to Represent the Milky Way: Pannekoek's Galactic Research and his Marxist Philosophy of Mind**

The main goal of Anton Pannekoek's galactic research was to understand the complicated and particular distribution of stars in the Milky Way system. His investigations toward this goal can be divided into two main parts. The first was to accurately represent the visual appearance of the Milky Way phenomenon, the second was to determine the location and distances of individual star clusters through statistical means. In both, he employed unique methods. For the representation of the Milky Way phenomenon, he depended on the intuitive ability of the human eye to capture the distribution of galactic light. Individual subjectivity, however, posed a problem in this method, and so he developed the mean subjective image which averaged over multiple drawings made by independent observers. Later, he also developed a photographic method where images were made extrafocally in an effort to mimic the inherent ability of the human eye. For the statistical distribution of stars, he relied on methods employed by earlier astronomers such as Jacobus Kapteyn and Hugo von Seeliger. Where they tried to capture the average distribution of stars of the entire system, Pannekoek focused on specific particularities in this distribution. Despite making use of the same statistical methods, his alternative approach led to results that went directly against the results of his predecessors. In my talk, I will present the unique methodology of Pannekoek's galactic research and show how his approach can be better understood when seen in light of his idiosyncratic Marxist philosophy of mind.



**Jennifer Tucker**

History Department, Wesleyan University, Middletown, CT, USA

**Uncovering Hidden Potential: Pannekoek, Popular Astronomy, and Scientific Socialism**

Anton Pannekoek (1873-1960), renowned astronomer and leader of the radical wing of the Dutch communist party, thought about how to expand the boundaries of what was known about the galaxy and equally how to visualize a radically new social order on earth. This paper will explore both dimensions of Pannekoek's creativity and capacity to think beyond the boundaries of the existing paradigm. It will explore, on the one hand, the scientific and cultural contexts of his early visual studies of the Milky Way, exploring the intertwined relationship between Pannekoek's drawing practices and those of leading British amateur astronomical community involved in the execution of planetary images in the 1890s, and the peculiar convergence of old and new media in visual studies of the Milky Way. On the other hand, it will consider his efforts in popular astronomy, including how the impact of Pannekoek's vision can be seen in the USSR, where in spite of his disagreements with Lenin, a generation of Soviets took his ideas and tried to implement his practices. It suggests that he had an important legacy in the history of Soviet space exploration. The paper will also address the similarities and also the significant differences between Pannekoek's scientific socialism and artistic practices and that of contemporary left-wing British scientists, artists and filmmaker in the interwar period.

**Gerrit Voerman**

Documentation Centre Dutch Political Parties, University of Groningen

**"A rigorous theorist": Anton Pannekoek and his struggle against authorities in the state and in the socialist movement**

Anton Pannekoek was not only an astronomer, but also a Marxist socialist theorist. His pronounced left-wing political views and his political activities were not conducive to his professional career, nor to his political career in the labour movement. Pannekoek developed a form of anti-authoritarian socialism in which the workers had to liberate themselves rather than follow the political parties and the trade unions which claimed to act in their name. Due to his radical-socialist ideas he frequently came into conflict with the authorities, and specifically with three Dutch Prime Ministers, Kuyper, Cort van der Linden and Ruijs de Beerenbrouck. At the same time, his anti-authoritarian opinions and his emphasis on spontaneous actions of the masses went too far in the eyes of many leaders of the workers' movement: he drew on himself the wrath of Troelstra, the leader of the Dutch Social Democracy, of the leading theorist of the German Social Democracy Kautsky, regarded as the 'pope' of international social democracy, and even the revolutionary Russian leader Lenin. It will be shown here that the clashes of Pannekoek with the Establishment were not solely the result of his radical theoretical views, but also of his rigorous personality.

**Alena J. Williams**

University of California, San Diego, USA

**A Galaxy of Appearances: Anton Pannekoek and the Visual Arts**

Since 1923, the Carl Zeiss optical manufacturing company in Jena had begun producing machines for its newly developed projection planetariums worldwide. Both phantasmagoric illusion and pedagogical tool, the projection planetarium was a hybrid object with affinities to Dutch astronomer Anton Pannekoek's methodological approach towards the visual representation of the Milky Way Galaxy. The projection planetarium—an unprecedented means of representing the night sky that called for the projection of images and pinpoints of light onto the interior surface of a self-supporting

dome—reflected a radical expansion of the cinematic imaginary that reverberated throughout modern visual culture. By 1927, Pannekoek’s scientific representations of the galaxy—composite images of various individual observations—were already integrated into the spectacle of the company’s full-dome projection system. His approach to preparing this representation of the Milky Way emphasized the subjectivity of perception, and the means by which our visual understanding of the galaxy are governed by a range of influences and contingencies. At the same time, this notion of subjective vision and the subjective nature of appearances was a mainstay in the visual arts, particularly within the modern period. Taking cues from these immersive planetarium displays of moving images, artists like László Moholy-Nagy of the Bauhaus School in Weimar and Stan Vanderbeek, who studied at Black Mountain College in North Carolina, dismantled the planetarium’s cinematic dispositif and recalibrated it into new configurations that tellingly engaged with the conflicted idealism of the 1920s Weimar period in Germany and the 1960s counter-cultural movement in America, respectively. Furthermore, the night sky with its countless stars and heavenly bodies have been of interest to visual artists for centuries, but its actual representation has been quite varied; this paper will also reflect on recent observations by contemporary artists.