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The reception of relativity in the Netherlands

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Physics as a Calling, Science for Society

Studies in Honour of A.J. Kox

Edited by

Ad Maas and Henriëtte Schatz

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5 The reception of relativity in the Netherlands

Jip van Besouw and Jeroen van Dongen

Albert Einstein published his definitive version of the general theory of relativity in 1915, in the middle of the First World War. The war greatly impeded the international dispersion of his work, as relations and communications between scientists in Allied and Central Power countries had largely broken down. Nevertheless, Einstein and his theory rose to fame shortly afterwards, when, in November of 1919, British astronomers claimed to have observationally verified the gravitational bending of light. Relativity still encountered difficulties in gaining acceptance in many quarters, however. In Germany, populist and academic ‘anti-relativist’ circles protested Einstein’s work. They were triggered by his pacifism, and the fact that he was a democrat and a Jew. Einstein further embodied a new kind of highly mathematized physics that seemed to marginalize the nineteenth century universalist experiment-cum-theory gentleman physicist.¹ In France, too, political and professional resentments coloured the reception of both relativity and Einstein.²

In the Netherlands, the country that we focus on in this chapter, interest in Einstein’s relativity picked up considerably at the end of 1912. In Germany, relativity was already more or less the leading interpretation of electrodynamics among theorists in 1911, but in the Netherlands H.A. Lorentz’ version still dominated. There were also strong local rival theories in Britain and France, and broad professional support for Einstein’s theory began considerably later there,³ while at the same time, interest in the theory was accompanied by strong public responses.⁴ As we will discuss here, responses were much more moderate in Holland. Even Dutch anti-relativists (only two have been identified as such in the literature so far: engineer M.W. Polak and well-known philosopher Gerard Heymans) struck a different tone, as A.J. Kox has pointed out: ‘they remained polite and were careful to avoid any impression of mounting a personal attack against Einstein and his fellow relativists.’⁵

One of the issues that we wish to address in this chapter is how the Dutch reception history of relativity compares to that in other countries: how does the Dutch case resemble or depart from the familiar stories of the larger European

nations? Part of the unique nature of the Dutch reception is, of course, due to Leiden's physicists, who played an important role in the genesis of both the special and the general theory of relativity. In this chapter, however, we wish to look at the way in which broader audiences than academic physics professionals viewed Einstein and his theory. Can we identify the factors that shaped the broader Dutch reception of relativity? How particular to the Dutch case were they? Holland had remained neutral during the First World War, and anti-German sentiments were considerably less strong than elsewhere. Did the dynamics of the World War and its aftermath still play a role in shaping public views on relativity? Of course, the Dutch physics elite was personally close to Einstein. To see how that could influence public perceptions of Einstein, we should first address how they themselves were viewed by the public. What relevant values were shared between university professors and other sectors of society? What was the status of science? In this essay we will take up these issues to see if they can shed light on the Dutch reception case. Vice versa, we hope that a closer look at the reception of relativity can also teach us things about the public status of science in the inter-war years.

The context for this chapter is provided by three studies that focus on the reception of relativity in the Netherlands. The first, by A.J. Kox,⁶ primarily discusses the reception of general relativity among Leiden's physicists, and contains a brief discussion of opposition to relativity. The second, a book and PhD dissertation by Henk Klomp, *De relativiteitstheorie in Nederland*, goes into more detail regarding the broader reception of the theory. Klomp relates how relativity influenced debates on the certainty of knowledge and the democratic ordering of society. He particularly hones in on how the theory played a role in discussions on secondary education between foremost historian of science E.J. Dijksterhuis on the one hand, and educational reformers Philipp Kohnstamm and Tatiana Ehrenfest-Afanassjewa on the other.⁷ We will return to Klomp's account later. The third article is by one of us,⁸ and touches on, among other issues, the Dutch reception of Einstein and relativity in comparison with German events, with a focus on Einstein's Leiden chair and the immediate period after Eddington's announcement. The current chapter can be seen as a short elaboration of this account.

Einstein's chair and Dutch internationalism

Let us first begin by addressing, very briefly, the reception of relativity and Einstein in academic circles. Einstein, of course, had already become friendly with Lorentz in 1911 when he visited Leiden, and had been exchanging letters with him since 1909. Yet, perhaps surprisingly, their correspondence did not discuss relativity in any substantial way before 1912.⁹ Lorentz was a towering presence in the Dutch scientific community and this showed, not only in his position as Chairman of the Sciences Section of the Royal Netherlands Academy of Arts and

Sciences in Amsterdam since 1910, but also in the status of his electromagnetic theory. Lorentz understood at an early stage what the differences were between his own work and Einstein's theory, and participated in the co-production of what came to be understood as 'relativity theory' while it took shape in the German literature. Nonetheless, he continued to prefer his own version of electrodynamics.¹⁰ Local scholarship tended to follow him in this preference, as is shown, for example, in the comparison of Lorentz' theory with Einstein's by J.D. van der Waals jr. in 1909¹¹, and Lorentz initially remained the primary Dutch authority on relativity.¹²

The notion that Einstein's theory could epistemologically be preferred seems to have come to the Netherlands with the arrival of Paul Ehrenfest. Ehrenfest had been involved in subtle German debates about relativistic rigid bodies, and was acutely aware of the theory's interpretative benefits and complexities, as is exhibited in his impressive inaugural lecture in Leiden, held in December of 1912.¹³ Lorentz and Ehrenfest began corresponding with Einstein on proto versions of general relativity,¹⁴ and in the period between 1915 and 1920, Leiden grew into a – if not the – early hub for relativity research. A steady stream of publications on the subject by W. de Sitter, J. Droste, A.D. Fokker, J.A. Schouten, H.A. Kramers, G. Nordström and others came from Holland.¹⁵

In 1920, Einstein held an inaugural lecture in Leiden after he had been appointed 'Special Professor' there. His friendships with Lorentz and Ehrenfest were of key importance in eventually accepting a tie with Leiden (he had actually turned down full professorships in Leiden twice before¹⁶), and, likely in deference to Lorentz, Einstein reinstated the spacetime metric as a kind of 'Lorentzian ether' in his lecture.¹⁷ Einstein's appointment had been held up considerably, as the Dutch authorities had mistaken him for the art critic and communist Carl Einstein: the delay is to be explained by political fears for communist revolutionaries.¹⁸ Einstein was, of course, proposed as a special professor first and foremost for his physics. Consideration of Einstein's political and personal views and those of his Leiden hosts may however assist us in understanding the broader Dutch reception history.

The two Leiden professors who were most directly involved in securing Einstein's appointment, Lorentz and Professor of International Law Cornelis van Vollenhoven, were also leading figures in the Dutch Academy. They were particularly responsible for its efforts to arrive at a reconciliation between the scientific communities of the formerly warring nations. Upon joining the newly created International Research Council in 1919, the Dutch Academy began to lobby for the admittance of sister academies from former Central Power countries that had been barred from membership. For Lorentz, this was a continuation of the reconciliation efforts he had undertaken during the war. Van Vollenhoven had seen a particular role for the Dutch in establishing international peace as early as 1910 and had expressed this in an influential article in *De Gids*, the country's leading

cultural journal.¹⁹ Both believed that the Netherlands could do its duty and further its own position by acting as a peace broker. They acted on this belief in their stewardship of the Dutch Academy's attempts at diplomacy.²⁰

Einstein's pacifism and his ideal of a supranational scientific community thus resonated with these Leiden professors in their self-chosen role of peace brokers.²¹ Indeed, just after accepting his special professorship, Einstein participated in an event organized through the Paris based Institut du Froid at Kamerlingh Onnes' laboratory in which Frenchmen Pierre Weiss and Paul Langevin also participated.²² As Ehrenfest expressed it, Einstein's role as special professor in Leiden 'will contribute enormously to the reestablishment of many disrupted scientific relations in an undemonstrative, yet therefore all the more powerful way.'²³

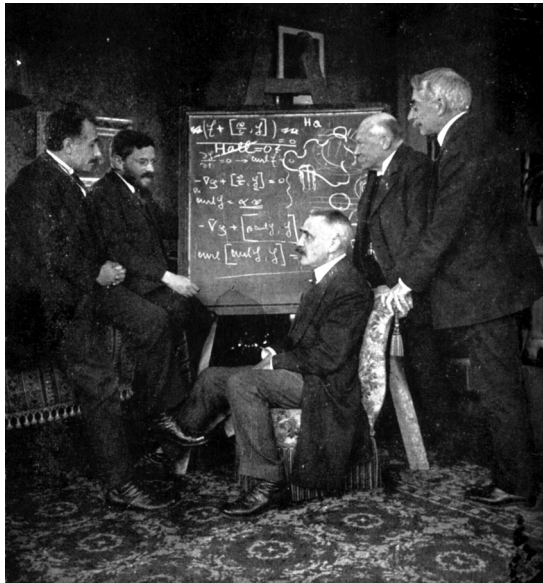


Fig. 1 – Albert Einstein, Paul Ehrenfest, Paul Langevin, Heike Kamerlingh Onnes and Pierre Weiss discussing problems in condensed matter physics in Onnes' home in Leiden in October of 1920

Dutch neutrality had a long history. It had been inspired by the vulnerable position of the Netherlands between the great European powers, and by a fear for its colonial interests.²⁴ In the late nineteenth century, Dutch intellectuals had grown afraid of domination by a recently unified Germany: a mediating role between the larger cultures of Europe could ensure Dutch independence and international relevance.²⁵ Already before the war, publicists and politicians had singled out endeavours for establishing peace and international law as a particularly Dutch moral obligation. The 1899 and 1907 peace conferences in The Hague had been

instrumental for this development. Van Vollenhoven, who had been enlisted by the government to participate in organizing a third conference that was supposed to take place in 1915, had played up nationalist sentiments by emphasizing the Dutch heritage in international law that dates back to Hugo Grotius; here, surely, was a task for which the Dutch should unite and a way for the nation to find new prominence.²⁶ Although the role of neutral countries as moral arbitrators between belligerents had become internationally compromised during the war, public opinion in the Netherlands still favoured policies of neutrality and internationalism.²⁷ Appointing Einstein would thus assist Lorentz and van Vollenhoven in placing Holland before the eyes of the international academic community as an indispensable peace broker, and Dutch scientists before the eyes of the Dutch public as prominently taking part in the realization of national ambitions.

Science on the defensive

So, ideals of neutrality and internationalism were shared between scientists and the public alike. Scientists were generally held in high regard, and their cultural status was unchallenged. Professorial appointments were regularly and enthusiastically reported in the press, and summaries of academic lectures, including technical presentations at the Academy, could be found in newspapers like the *Algemeen Handelsblad* or the *Nieuwe Rotterdamsche Courant*. Partly responsible for this state of affairs was, of course, the international prestige of Dutch researchers: between 1901 and 1913, no less than five Dutch scientists had won a Nobel Prize.²⁸

The relations between science and society changed near the end of the war. The number of students had steadily increased since the turn of the century. This increase was accelerated by a new law in 1917 that made studies in the sciences even more accessible: proficiency in classical languages and a *gymnasium* diploma were no longer required. As a consequence of the increased enrolment, professors felt a greater urgency to create new career opportunities for their students. Thus, they reached out to industry to set up joint projects: eventually, physicist L.S. Ornstein in Utrecht, for example, would deliver 42 PhDs to companies like Philips Electronics and the *Bataafsche Petroleum Maatschappij*, a subsidiary of Royal Dutch Shell.²⁹

While a solid belief in the social benefits of science had already taken hold since the late nineteenth century, this had not immediately led to much research aimed directly at reaping these benefits.³⁰ However, the war had produced shortages of various kinds – like in the belligerent countries – and this was another incentive for the Dutch to find ways to make science help alleviate them. This effectively started up large-scale industrial research in Holland. The new emphasis was exhibited by the installation in February of 1918 of the ‘Scientific Committee for Advice and Research in the interest of National Prosperity and De-

fence.' It was headed by none other than Lorentz, and intended to fund the research reflected in its name.³¹ Lorentz, like most of his generation and like a true theoretical physicist, had of course preferred, at his peak, to practice *science pour la science*, even though he also believed that the ultimate justification lies in the social and technological progress science could bring.³² His committee was disbanded in 1922, as its results were judged as too poor and its focus as too academic. Instead, another committee headed by biologist F.A.F.C. Went concluded that the state needed to institute a central organization that more explicitly and effectively aimed directly at 'applied science.'³³

Added to this shift in the desired role of science should be the complaints of scholars like Dijksterhuis and Kohnstamm, who observed an increase in anti-scientific and anti-intellectualist sentiments in Dutch culture in the 1920s.³⁴ Despite these pressures, most professors were still convinced that only free research and education, aiming at 'academic' values instead of practical careers, belonged at the universities. The proper place to do science was up in the ivory tower, from which *Bildung* would be handed down to students, and would eventually trickle down further into society.³⁵ Yet, how were such stances perceived beyond university campuses? Could they still be maintained and expect support in a society that was rapidly moving towards more democracy – universal suffrage for men was introduced in 1917 – and increasingly demanded applicable knowledge? We will see in a short survey of Dutch newspapers and other non-academic publications whether these issues coloured the reception of relativity in any substantial way. Relativity, after all, seems an obvious example of elitist ivory tower science. The reception of relativity and Einstein may, in turn, also tell us more about the status of science in the post-World War One years.

Important for the introduction of relativity to the Dutch public were the many public lectures held on the subject by Leiden's leading physicists between 1913 and 1919. These lectures would often find their way into the press and many were published in full. They usually took place before learned societies like the *Genootschap ter Bevordering van de Natuur-, Genees- en Heelkunde* (Society for the Advancement of Science, Medicine, and Surgery) in Amsterdam, or Rotterdam's *Bataafsch Genootschap der Proefondervinderlijke Wijsbegeerte* (Batavian Society for Experimental Philosophy). Audiences ranged from well-educated professionals to academic scholars.³⁶ Engineers were a particularly receptive audience and from their ranks rose several popularisers and critics, such as Polak.³⁷

Why did Lorentz, Ehrenfest and others put so much effort into popularizing relativity theory? Apart from obvious reasons like the enjoyment it might give them, or a feeling of responsibility for sharing the most recent scientific insight with their fellow citizens, there was also a sense of urgency.³⁸ In 1922, Fokker, who had worked with Einstein in Zurich after having obtained his PhD with Lorentz in 1913, wrote to the editors of *De Gids*: 'popularization is an inescapable task in order to maintain the viability of science, when it is not aimed at applica-

tions.’³⁹ In his opinion, fundamental physics in particular hung in the balance, which made it all the more necessary to get the ‘educated layperson [...] sympathetically and closely involved’ in its discussions.⁴⁰ That such efforts were necessary but could have less of a result than was hoped for is exhibited by the report in the leftist-liberal magazine *De Groene Amsterdammer* about the sixteenth *Nederlandsch Natuur- en Geneeskundig Congres* (Dutch Scientific and Medical Congress) in 1917: the reporter applauded the recent effort to make the sciences more accessible to students, as this could counteract the highly inopportune shortages of qualified staff in industry. Having been greatly impressed by a lecture on war surgery, he further stated that medicine in particular constitutes ‘the most beautiful application of science’ and that it was ‘more beautiful and useful than theories about the motion of heavenly bodies or the constitution of the atom.’⁴¹ Lorentz and Ehrenfest had been the star attractions at the congress: Lorentz had lectured on general relativity, and Ehrenfest had introduced the Bohr atom. Yet, the *Groene*’s reporter had apparently not been impressed.

Economic pressures and the process of socio-cultural democratization – we will return to this issue later when we discuss Klomp’s account – led to a less than self-evident position for the sciences. Consequently, scientists saw a need to show themselves as accountable to society. By popularizing the topic in lectures, theorists tried to justify their interest in the issues addressed by relativity. In turn, relativity was used, through its popularization, to legitimize the position of fundamental physics. Popularizing was done in newspaper articles too, and will consider these now.

Public reception

Public interest in relativity picked up greatly in the Netherlands after the 1919 confirmation of the gravitational bending of light, as it did elsewhere. The number of newspaper reports on Einstein and relativity quickly grew from a handful to over a hundred per year. Before 1919, relativity and Einstein were basically reported only on in newspapers and magazines that were read by the academically educated elite, such as, in the case of newspapers, the *Algemeen Handelsblad*, the *Nieuwe Rotterdamsche Courant* or the *Nieuws van den Dag*.⁴² Cultural journals like *De Gids* and *Onze Eeuw* regularly included articles on the sciences. Already before Eddington’s announcement they had contained contributions on relativity by Lorentz and his Leiden colleague J.P. Kuenen.⁴³ After 6 November 1919, the date of Eddington’s presentation, a broad spectrum of publications began including articles on relativity and particularly on Albert Einstein himself.⁴⁴ This may have been aided by Lorentz’ praise for him in his newspaper article of 19 November, ‘Gravity and light. A confirmation of Einstein’s theory of gravity.’⁴⁵

By 1920, Einstein had become a celebrity in Holland, as he had elsewhere: his lectures, honours, troubles and job offers were eagerly reported, spurred on by

the anti-relativity furore that had picked up in Germany that year.⁴⁶ That story was particularly closely covered, just like his appointment in Leiden and the associated travails.⁴⁷ Relativity's alleged incomprehensibility and its counterintuitive or avant-gardist nature very quickly became familiar tropes. For instance, in its report on the notorious French serial killer Henri Désiré Landru, *Het Vaderland* pointed out that 'indeed, *rien ne se crée et rien ne se perd*, whatever Einstein and other Dadaists among the modern physicists may say: even light-hearted women do not evaporate completely into thin air if you burn them in the stove'⁴⁸ (that is, the material evidence in Landru's case had not successfully been made to disappear into nothing by the culprit). In any case, the idea was universally shared and was largely considered to be unproblematic among journalists that Einstein's general theory of relativity was, in the words of Lorentz, a 'lasting monument of science'.⁴⁹ Clearly, given that Einstein had become famous, relativity would be particularly suited for popularizing and legitimizing theoretical physics, while at the same time, these popularizations themselves would, of course, feed back into Einstein's fame.

As discussed earlier, members of the Dutch elite were keen to portray themselves as internationalists and Einstein's role in Leiden could aid them in doing so, while they tried to realize their pacifist goals at the same time. Indeed, Einstein's participation in the 1920 conference on superconductivity in Kamerlingh Onnes' home, with Weiss and Langevin in attendance, was reported in a newspaper article with the headline: 'Leiden as an international scientific centre.'⁵⁰ The same piece further discussed a recent meeting, also in Leiden, between Einstein from Berlin, James Jeans from London, and a number of Dutch astronomers. Einstein himself was specifically identified with international reconciliation attempts: *Het Vaderland* approvingly reported on a lecture by Einstein at King's College, where its correspondent saw a 'true attempt to bury a terrible past.'⁵¹ Einstein's trip to Paris in 1922 received coverage that was at least as extensive and again his reconciliation efforts were the main theme.⁵² Clearly, the press was well aware that any Dutch attempts to achieve academic reconciliation would receive substantial support through Einstein's public persona.

At the same time, Dutch reporters disapproved of the anti-relativity events in Germany, and saw the ills of Germany's old order and its rightist reactionaries with anti-Semitic motives reflected in those events.⁵³ In all, to reporters Einstein had very quickly become an iconic figure, who combined a rock solid reputation in science with progressive and internationalist politics, and a commitment to Jewish causes;⁵⁴ relativity was an achievement for which he should universally be revered and only ignorance or bigotry might obstruct such judgement. Dutch scientists under pressure would thus do well to show their professional and personal proximity to Einstein. By the end of 1920, after the news cycle on the British eclipse results, on Einstein's 'special' professorship in Leiden and on his reactionary opponents had run its course, Einstein had become a celebrity, an 'idol'.⁵⁵ A

column in the Easter issue of *Het Vaderland* in April of 1922 related a ‘kaleidoscopic conversation’ on modern culture between a lady and two gentlemen: when discussing sexologist Eugen Steinach, Oswald Spengler, theosophism, spiritism and transcendentalism, the conversation ‘came upon Einstein. How could you not talk about him?’⁵⁶

We have seen so far that, by and large, the Dutch public responded quite positively to Einstein in the years immediately after World War One. Science was under pressure to produce more applicable work, yet theoretical physics was still held in high regard, and in fact it could use relativity to exhibit a renewed relevance for itself that honoured Lorentz, while it also indicated novel intellectual horizons beyond his work. Einstein’s close relationship with Leiden and its physicists of course aided this dynamic: it made it possible for Dutch audiences to identify with relativity even more strongly as it could be considered to be tied to local culture. At the same time, local scholarship extensively engaged with relativity and its creator, and shared this through the press. These circumstances are particular to the reception of relativity in the Netherlands.

Einstein’s positions on the war were well known, and quite positively regarded. In fact, they resonated strongly with the Dutch, given their internationalist views. Einstein’s negative judgement on the role of conservative German elites was widely shared, and the anti-relativity actions were condemned equally as a misguided expression of ‘pan-Germanic’ sentiments.⁵⁷ These circumstances are again particular to the Netherlands, but when considered from a broader perspective, they show once more that Einstein’s, and subsequently relativity’s reception was very much shaped by the highly politicized context of the war and its aftermath. In this sense, the Dutch case does resemble the reception histories of other European nations, even though the Netherlands had remained neutral, and its war years had been much less turbulent.

Relativity, democracy and educational reform

The Dutch reception of relativity was not universally positive, though. The theory soon engendered questions on the status of truth in scientific knowledge that played a key role in heated debates about the proper way to teach science in secondary schools. These debates were closely related to views on how society should ideally be organized: governed democratically, with the largest possible number of citizens enjoying a secondary education aimed at forming well rounded ‘persons’, or ruled instead by a select and particularly competent group, steeped in abstract mathematically deduced truths, à la Plato. Those who held the latter position generally saw relativity as a threat. In what follows, we will outline the debate, basing ourselves on Henk A. Klomp’s extremely valuable book *De relativiteitstheorie in Nederland. Breekijzer voor democratisering in het interbellum*,⁵⁸ even if we do not necessarily agree with all its aspects. Klomp’s story has not been taken

into consideration sufficiently outside the Netherlands, so a more extensive discussion of his work is warranted. At the same time, we would also like to draw this account into a wider comparison, using what we have learnt from other reception studies.

In the debates that Klomp has described, the most interesting critic of relativity was philosopher-psychologist Gerard Heymans. Some of his positions were, in turn, of relevance to historian of science Eduard J. Dijksterhuis in his discussions on education. Dijksterhuis was employed as a mathematics teacher for most of his career, and his views on education were prompted first and foremost by his concern about mathematics education. Heymans, a professor in Groningen, was a prominent intellectual of the ruling conservative-liberal elite. His views on knowledge and learning supported the social status quo before the introduction of universal suffrage in 1917. He believed that certain and objective judgements about nature could be made, and motivated this view by pointing to Kant's *syntheses a priori* and how these grounded mechanics; to Heymans, Newton's axioms and the constitutive role of Euclidean space were definitive. Again inspired by Kant, Heymans further believed that just as one could have certain knowledge of nature, one could also make moral judgements that were certain and objective, if one would only let the human ratio run its deductive course. Not everyone, however, could be expected to make such universal judgements: only those that had been steeped in the deductions of the sciences could be expected to see Plato's shadows and act morally. Only the intellectual elite, then, was suited to govern; extending the right to vote would weaken the state by introducing non-objective judgements that were not aimed at the common good, which would make the state vulnerable to special interests. Heymans' conservatism was shared by many academics of his generation, such as influential historian and culture critic J. Huijzinga, and to some extent also by Lorentz, although he was also a democrat.⁵⁹

In the 1910s Heymans, already in his sixties, was confronted by scientists like Jacob Clay and Jan Schouten, who contended that his system was in conflict with the theory of relativity. Heymans reacted in 1921 by dismissing relativity in the pages of *De Gids*: Einstein had assumed that all knowledge was grounded in observation, thereby ignoring synthetic *a priori* judgements. The new facts that relativity could explain should be considered too small in number to 'shake the foundations.'⁶⁰ For Heymans, only explanations that gave real insight, based on obvious and evident foundations, could give the certainty of true knowledge. In essence, he simply compared relativity to his own epistemology, and found it wanting. Still, it must have been difficult for Heymans to argue against the new scientific consensus, given the authority that the sciences enjoyed in his system.

Fokker responded immediately and strongly (he was something of a Dutch version of Hans Reichenbach⁶¹). He pointed out, for instance, that there was no need to consider absolute space a precondition to our knowledge of the world. Heymans' most relevant critic was physicist and pedagogue Philipp Kohnstamm.

Kohnstamm maintained that Heymans illicitly imposed a human measure on nature when he insisted that physics needed to provide theories endowed with explanatory power. For Heymans, such theories gave certain knowledge, but Kohnstamm believed that one could possess no such thing: truth was like a person, whom one could meet, but never possess. He credited the insight that knowledge could not be certain to the appearance of the theory of relativity: natural laws had proven to be mere idealizations with only a limited validity. Such uncertainty was to be expected for knowledge grounded in experience and it also implied that one could not expect determinist certainty in moral judgements. This made room for religious and intuitive considerations in taking ethically just decisions (Kohnstamm, who was born Jewish, had been converted to Christianity in part because of his interactions with J.D. van der Waals sr.) Education should thus aim at forming emotionally rich and responsible characters, Kohnstamm argued in 1926: developing well rounded ‘personalities’ was its essential task, according to his ‘personalist’ philosophy. Klomp points out that Kohnstamm placed a person’s conscience above his ratio, so political power need not be restricted to those who have enjoyed a state education in accordance with Plato’s ideals.⁶² Kohnstamm was indeed a democrat: in fact, he had been party chairman of the *Vrijzinnig Democratische Bond* in 1917 that was partly responsible for introducing universal suffrage.

Fokker and Tatiana Ehrenfest-Afanassjewa, the wife of Paul Ehrenfest, presented ideas similar to Kohnstamm’s. Both believed that intuitive and empirical reasoning should precede the introduction of abstract, deductive mathematics in education. They, too, pointed to relativity to justify their ideas. By the mid-1920s, Heymans had retired from criticizing relativity and his role was taken over by E.J. Dijksterhuis. Dijksterhuis was particularly concerned about the place of ‘mechanics’ in the Dutch secondary school curriculum. At the *Hogere Burgerschool* (the recently established advanced secondary school type that did not offer classical languages), mechanics had its own weekly four-hour slot, and was taught by mathematics teachers in a strictly deductive way, starting with Euclidean and Newtonian axioms. Physicists now appealed to the authority of relativity, claiming that mechanics was really an empirical science and that they should be the ones teaching it. The heated debate prompted the Ministry of Education to seek advice from, among others, Fokker and Dijksterhuis. In the end, it decided in 1934 to retain the mechanics course in its existing format.

Dijksterhuis’ response to relativity was subtler than that of Heymans. He enlisted his historical scholarship in the hope of defusing its threat. Dijksterhuis argued that relativity was not nearly as innovative as had been claimed: since Galileo, the goal of physics had been to capture the simplest mathematical expression of the facts, and this process of mathematization had brought the only true progress in the sciences. The process had reached its pinnacle with the formulation of Newton’s axioms: Einstein’s theory was just a recent addition.⁶³ Relativity

still lacked a proper formal structure, and was, therefore, not suited to be presented in schools. Dijksterhuis strongly believed in Plato's educational philosophy, in which students were brought up in the strictest mathematical rigor: according to Dijksterhuis, deduction taught that claims needed to be substantiated, and built character. Empirical methods could not be a suitable replacement, and introducing relativity itself would undermine the deductive courses in mathematics, as it undermined their axioms. In 1937, Dijksterhuis ended up defending that the school curriculum should depart from the latest scientific consensus if that was necessary to retain Platonist ideals.

Dijksterhuis' influence was substantial in the 1920s due to, among other things, his membership in many advisory committees on educational matters, and it was boosted further when he became Secretary of the editorial board of *De Gids* in 1933. Kohnstamm criticized him for not caring about the dropouts of his selective mechanics courses, while for Dijksterhuis only educating the ruling elites seemed to matter. Dijksterhuis did feel intellectually at home with fascist ideologies and briefly joined the *Nationaal Front* – a marginal group that was fairly prominent in Dijksterhuis' home town of Oisterwijk – only to quickly resign his membership when he was confronted with the group's anti-Semitism.⁶⁴ In 1943, during the German occupation of the Netherlands, he accepted a professorship in history of science at the University of Amsterdam, which was considered a much graver offence after the occupation had ended. After 1945, Kohnstamm's ideas on education, and those of like-minded intellectuals such as Ehrenfest-Afanassjewa, gained much authority and in effect began to guide educational reform when the newly constituted Dutch Labour party (*Partij van de Arbeid*) embraced them in 1951.

It is interesting to note that Einstein, when expressing his pedagogical ideals, found, just like Kohnstamm, that schools should try first and foremost to form a 'harmoniously developed person' with a 'lively feeling for values,' and that he pointed to the absence of authoritarian school systems in 'democratically governed countries.'⁶⁵ Kohnstamm emphasized that drilling was the educational method of dictatorships, while Dijksterhuis held that hardly any student 'is strong enough to be able to be free.'⁶⁶ It is not too hard to imagine that a young Einstein might have been unhappy in Dijksterhuis' mechanics courses.

Thus, according to Henk Klomp, by inspiring Kohnstamm and others the theory of relativity eventually contributed to the democratization of the Netherlands.⁶⁷ This conclusion is unproblematic, as far as we are concerned, when considered straightforwardly on the level of historical facts. Yet, Klomp also raises the rhetorical question whether the course of events could have turned out differently if it were not for the theory of relativity. His answer simply repeats the factual claim, thereby implicitly emphasizing the instrumental nature of the theory of relativity in this process of democratization. Of course, elements of Einstein's theory went against certain presumptions of the epistemologies of Heymans and, though less so, of Dijksterhuis. Still, the contingencies in this story should not be

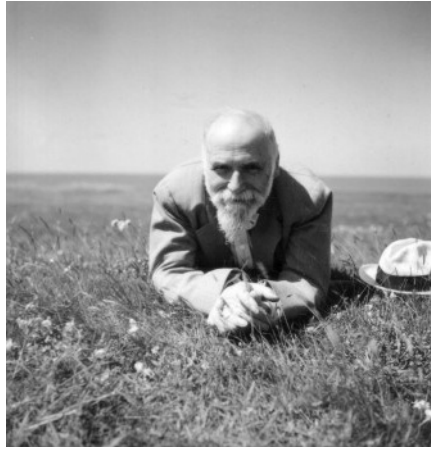


Fig. 2 – P.A. Kohnstamm in 1935, 60 years old, picture by his son, G.A. Kohnstamm.
Source: Dolph Kohnstamm

overlooked. The Netherlands was already democratizing due to forces far greater than the intellectual challenges posed by relativity. We can very well imagine scenarios in which other theories of physics would have played similar roles, as the determination to criticize conservative epistemologies was stronger than the force of arguments that might be mustered by relativity could ever be. Kohnstamm, for example, even claimed in 1926 that relativity introduced a new level of indeterminacy due to its inherently four-dimensional nature, despite personally communicated strong criticism of this point by Ehrenfest.⁶⁸ Clearly, Kohnstamm's aim was to dismiss epistemologies because they obstructed his pedagogy, rather than because he wished to convince Heymans, Dijksterhuis, or anyone else of the consequences of relativity theory. In all, the observation that the extensive public presence of relativity was partly due to inevitable philosophical debates that accompanied the Dutch democratization process seems at least as justified as the notion that relativity intrinsically promoted that process and its debates.

Dijksterhuis, Heymans and the groups that they represented were not the only ones that objected to relativity. Klomp has reviewed its reception from the perspective of the social and ideological 'pillars' that typify Dutch society of the period.⁶⁹ Thus, he has further identified Catholic and Protestant critics, such as philosophers P.H.J. Hoenen and D.H.Th. Vollenhoven, and some socialist enthusiasts for relativity like Gerrit Mannoury. Similarly, our study of the newspapers of the period has taught us that responses in various groups were reflective of those groups' primary interests, though it should be added that Catholic or Protestant media did not report on Einstein or relativity critically, but simply less frequently or jubilantly. Addressing responses from the perspective of the ideological 'pillars' does not seem to add much beyond what one would expect, namely that

these responses reflect Dutch 'pillarized' culture to some extent. Beyond the 'pillars', however, Klomp has also identified a common ground that critics of relativity shared: he agrees with the observations of philosopher and logician Evert Beth, who argued in 1964 that relativity had threatened the 'principle of obviousness', i.e. Aristotle's principle that the foundations of knowledge should be obvious, which played a central role in both Enlightenment and Christian philosophies. Thus, critics of relativity had defended their metaphysical beliefs by denying relativity proper authority in contradicting their epistemologies.⁷⁰

Klomp has presented most of all a rich history of ideas, but he also draws attention to the fact that relativity's critics feared for the social positions and arrangements that were intellectually justified through their epistemologies.⁷¹ This brings us to familiar territory: Dutch critics, though less radical, vehement, or explicitly political, were, then, basically just the same as their anti-relativist counterparts in countries like Germany or the US: they opposed the marginalization of their social and cultural values and positions. They believed that these had come under threat from the forces of modernization, forces whose other manifestations could range widely from abstract art or political change to specialization in the sciences, but which they identified directly or even only metaphorically with the theory of relativity.⁷² Differences can, however, also be observed. As noted, the exchange of arguments in Holland was considerably more civilized than elsewhere, and there was virtually no vocal opposition from within the physics discipline itself that reached beyond the polite confines of academic debate. Circumstances that are particular to the Dutch context – the role of Lorentz and the ideals of neutrality and internationalism – have no doubt contributed to the moderate nature of the debate. In any case, it is most important to observe that Dutch opponents to relativity, when they tried to obstruct changes in education or debated the necessity of a priori judgements, ultimately tried to resist social change and the downgrading of their positions and values. Their opposition thereby exhibited the same dynamic as that of anti-relativists in other post-World War One societies.

Conclusions

The Dutch position in the international political context of the Great War and its aftermath played a substantial role in the presentation of Einstein and relativity to the public, and subsequently in how they were appreciated. The Dutch situation was quite different from that in neighbouring countries, yet it shares with them the circumstance that the reception of relativity was very much coloured by the war.

The prominent presence of relativity in Dutch society should be ascribed first of all to the culturally prominent position of the sciences in the period. Yet, as we have shown, that position came under pressure. In the case of relativity, this pres-

sure actually aided the introduction of the theory, as theoretical physicists like Fokker chose it to present their field; internationally prominent, yet closely tied to the Dutch tradition in physics, relativity seemed ideal for this purpose. Furthermore, Einstein's internationalist stances were appreciated by Dutch audiences, which again led to more, and more positive reporting on both Einstein himself and his theory. Finally, debates fuelled by the democratization of Dutch society drew in relativity, as the theory was well suited for dismissing conservative epistemologies. Thus, the public rise of relativity both resonated with, and accelerated Dutch society's democratizing forces.

There was also criticism directed at relativity. Physicists who preferred the ether, like Van der Waals jr., largely limited themselves to civilized if not predominantly academic debate – Van der Waals jr. actually expressed himself quite positively about relativity in the early 1920s⁷³ –, or, like Lorentz, they would still find many things to applaud Einstein and his theory for. Henk Klomp has shown that the most relevant public criticism originated in quarters that felt the theory was unjustly granted authority in epistemological matters. This sentiment was shared by a number of authors of various conservative persuasions, who, as we saw, resisted relativity, as they perceived it as a threat to their values and the associated social positions or ideals. Although the Dutch opposition to relativity refrained from personal attacks, which was quite different elsewhere, we have argued that its underlying motivation derived from political and social frustrations or fears similar to those in other countries. Thus, the Dutch reception of relativity, though atypical in its particulars, was not atypical in an international comparison when viewed from the broader perspective of social change and its discontents. In sum, then, we conclude that the Netherlands has a reception history that departs from familiar stories of larger European nations in its details, but resembles them in its underlying dynamics.

Notes

1. See Goenner (1993), Rowe (2006), Van Dongen (2007), Wazeck (2009).
2. Reactions to Einstein's visit to France are discussed in Biezunski (1987) and CPAE 13.
3. Paty (1987), Warwick (2003).
4. For France, see Moatti (2007), Van Kimmenade (2010); for Britain see e.g. Stanley (2003).
5. Kox (1992), pp. 46-47. Leiden's Hegelian philosopher G.J.P.J. Bolland did inveigh against relativity, as an extension of his attacks on Lorentz and physics in general, but Bolland was a notorious and somewhat indiscriminate troublemaker (Otterspeer, 1995).
6. Kox (1992).
7. Klomp (1997).
8. Van Dongen (2012).

9. The correspondence between Einstein and Lorentz can be found in Kox (2008); it began in 1909 and before 1912 it mostly dealt with problems in radiation theory.
10. See e.g. Staley (1998), pp. 288-289; on the differences between Einstein and Lorentz, see for example Janssen (2002).
11. Van der Waals jr. (1909).
12. See for instance how De Sitter (1911, p. 389) acknowledged discussions with Lorentz.
13. See Ehrenfest (1912), Klein (1970), pp. 1-5 and 151-154.
14. Kox (1988), CPAE 5, CPAE 8.
15. See Kox (1992) for an overview.
16. Kox (1993); Einstein to Ehrenfest, 12 September 1919, Doc. 103, CPAE 9; Van Dongen (2012).
17. Einstein (1920), p. 13.
18. See Van Dongen (2012).
19. Van Vollenhoven (1910).
20. On the academic rift at the time of the creation of the IRC, see Kevles (1971); on the mediating role of the Dutch, see Otterspeer & Schuller (1997), Van Lunteren (2006), Somsen (2012).
21. For Einstein's positions, see e.g. Rowe & Schulmann (2007), pp. 85-88; on their relation to those of his Leiden colleagues, see Van Dongen (2012).
22. For the science discussed at the event, see Sauer (2007).
23. Paul Ehrenfest to Albert Einstein, 9 December 1920, CPAE 10, pp. 286-289.
24. Voorhoeve (1985), pp. 32-35.
25. Otterspeer & Schuller (1997).
26. Corduwener (2012).
27. For a nuanced treatment, see Tames (2006), pp. 262-265.
28. See Willink (1991) and Maas (2001) for explanations of this disproportionate success.
29. Dorsman (2007), pp. 14-15; Heijmans (1994).
30. Theunissen (1994).
31. See e.g. Huijnen (2007), and references therein, and Huijnen's contribution to this volume. In 1918 Lorentz also became the chairman of another committee devoted to the closing off of the *Zuiderzee*, see Kox (2007).
32. Theunissen & Klomp (1998).
33. Van Rooij (2007).
34. Klomp (1997), pp. 9-12; see Baneke (2008), especially pp. 39-42, for a slightly different point of view.
35. Baneke (2006), pp. 32-36.
36. Klomp (1997) lists a substantial number of these lectures, see p. 233; speakers included Lorentz, Ehrenfest and Fokker. Examples of their publications are: Lorentz (1913), (1915).
37. See e.g. G.J. van de Well (1913); W.L. Brocades Zaalberg (1915); M.W. Polak (1918). Lorentz also published on relativity theory in *De Ingenieur*; see e.g. Lorentz (1917).
38. Lorentz greatly enjoyed giving public lectures, according to his daughter (De Haas-Lorentz [1957], p. 86); Ehrenfest apparently complained about giving public lectures, yet he could use the extra income they provided (Hollestelle [2011], p. 189).
39. Fokker to Kuenen, 31 July 1922; cited in Klomp (1997), pp. 54-55.

40. Fokker in his book review of *Over den wereldaether* by J.D. van der Waals jr., cited in Klomp (1997), p. 54.
41. R.T.A. Mees, 'Zestiende Nederlandsch Natuur- en Geneeskundig Congres', *De Groene Amsterdammer*, 21 April 1917, p. 2.
42. Dutch newspapers from the period can be accessed through the website of the Koninklijke Bibliotheek in The Hague; see <http://kranten.kb.nl/> (accessed on 23 April 2013). For a description of their political position and readership, see Wijffes (2004).
43. See Lorentz (1915), Kuenen (1917).
44. For example, titles as diverse as *Het Vaderland*, the local *Rotterdamsch Nieuwsblad* and the Catholic paper *De Tijd* now regularly reported on Einstein.
45. Lorentz (1919).
46. See for example: 'Einstein', 14 May 1920, *Het Vaderland* (announced Einstein's Leiden special professorship); 'Einstein een Duitscher', 26 May 1920, *Algemeen Handelsblad* (informed readers of Einstein's birthplace and nationality); 'Prof. Dr. Einstein', 27 August 1920, *Nieuwe Rotterdamsche Courant* (Einstein replied to his critics in the *Berliner Tageblatt*); 'Prof. Einstein', 8 September 1920, *Algemeen Handelsblad* (Einstein may receive the offer of a chair in Bern); 'Een Einstein vergadering', 26 September 1920, *Algemeen Handelsblad* (on the debate with Philipp Lenard at Bad Nauheim; for more on the anti-relativity events in 1920, see the references in note 1).
47. For example: 'Prof. Einstein te Leiden', 18 May 1920, *Algemeen Handelsblad*; *Het Vaderland*; *De Tijd*; 'Prof. Einstein', 27 October 1920, *Leeuwarder Courant*; 'Prof. Einstein', 18 October 1920, *De Sumatra* post.
48. 'Uit het laboratorium van Désiré Landru', 1 August 1920, *Het Vaderland*; for the incomprehensibility of relativity as a rhetorical element, see e.g. 'De toestand', 24 November 1921, *Nieuwe Rotterdamsche Courant*.
49. Lorentz (1919).
50. 'Leiden als internationaal wetenschappelijk centrum', *Algemeen Handelsblad*, 15 November, 1921.
51. 'Zomer in en buiten Londen', *Het Vaderland*, 22 June, 1921.
52. See for instance 'Einstein over den internationale toestand', *Het Vaderland*, 10 April 1922.
53. For example: 'Studenten en politiek', *Algemeen Handelsblad*, 14 February 1920; 'Heinevereering', *Het nieuws van den dag voor Nederlandsch-Indië*, 20 November 1920; 'Albert Einstein', *Het Vaderland*, 29 August 1920; 'Broederschap', *Het Volk*, 3 September 1920; 'Einstein', *Nieuw Israëlietisch Weekblad*, 3 September 1920.
54. On Einstein's Zionism, see e.g. 'Opbouwfonds', *Algemeen Handelsblad*, 21 November 1919.
55. As in *Wereldkroniek*, cited by *Nieuwe Rotterdamsche Courant*, 11 August 1921.
56. 'Kaleidoscoop', 'Gesprek', *Het Vaderland*, 16 April 1922.
57. See 'Heinevereering', *Het nieuws van den dag voor Nederlandsch-Indië*, 20 November 1920.
58. Klomp (1997).
59. On Lorentz and Heymans, see Theunissen & Klomp (1998); on Lorentz as a democrat, see e.g. Klomp (1997), p. 52.
60. Heymans (1921), p. 98, as cited in Klomp (1997), p. 84.

61. Reichenbach vigorously defended relativity against any criticism in the German language; see Hentschel (1990).
62. Klomp (1997), pp. 135-139.
63. Klomp believes that the debate on mechanics strongly influenced Dijksterhuis' arguments in his *Mechanization of the world picture* and *Val en worp* ('Free fall and projectile motion'); see Klomp, pp. 143, 183 and 200. For Dijksterhuis' reaction to relativity, see also Van Berkel (1996), p. 150.
64. Van Berkel (1996), pp. 262-266.
65. Albert Einstein, 'Education for independent thought', *New York Times*, 5 October 1952, on p. 72 in Einstein (1994); and 'On education', address at the tercentenary celebration of higher education in America, Albany, N.Y., 15 October 1936, pp. 63-69 in Einstein (1994), on p. 66. We thank Huub Rutjes for drawing our attention to these articles. Also, one can easily see connections between Ehrenfest-Afanassjewa's ideas on education (Klomp 1997, pp. 166-169) and Einstein's epistemology, as for example found in the latter's essays 'Geometry and Experience' (1921) and 'On the method of theoretical physics' (1933), pp. 254-268 and 296-303 in Einstein (1994).
66. Klomp (1997), p. 208.
67. Klomp (1997), p. 220.
68. Klomp (1997), pp. 129-131.
69. Klomp (1997), chapter 4, 'Einstein en de verzuiling'; for an account of the 'process of pillarization' during the interwar years, see Lijphardt (1968).
70. Klomp (1997), pp. 221-225.
71. Klomp (1997), in particular p. 118.
72. Recent literature that engages with this perspective is: Wazeck (2009), (2013); Van Dongen (2010), (2012). Interestingly, even Paul Ehrenfest, though a proponent of relativity and other theories at the vanguard of modernity, also struggled with some of its consequences; see Van Lunteren & Hollestelle (2013).
73. Van der Waals jr. (1921), p. 84; (1923), p. 94. On Van der Waals' positions in physics, see Maas (2001), pp. 151-155.

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