

## **In the footsteps of the quantitative revolution? Performing spatial science in the Netherlands**

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### **Abstract**

The Netherlands is commonly described as a latecomer to the quantitative revolution. Dutch spatial science coincided with the societal transformation of the late 1960s that included the professionalization, upscaling and democratization of higher education. Although these changes profoundly changed Dutch human geography, lumping together this transformation with the quantitative revolution largely erased the memory of an earlier phase of Dutch quantitative geography in the 1950s. This earlier wave originates in Dutch geography's engagement with applied research by sociologists, urbanist-engineers and economists in the immediate post-1945 period. In the urgency of post-war rebuilding, in which geographers found a significant source of employment, quantitative methods were debated and welcomed to speed up the survey process in spatial planning. The chapter describes how quantitative methods took root in Dutch geography in these two waves in the 1950s and 1960s, and discusses why the first has been largely forgotten. While the 1960s generation performed the quantitative revolution as taught by anglophone textbooks, the emergence of quantitative geography got caught up with the democratization movement in higher education. Resultantly, the conception of the Netherlands as latecomer became lodged in the historiography.

**Keywords:** Applied geography, History of geography. Post-war reconstruction, Spatial Planning, Spatial science, The Netherlands.

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### **Introduction**

The textbook account of the Dutch version of geography's quantitative revolution is clear-cut. The Netherlands 'lagged behind in the revolutionary mood', but caught up in the 1970s pretty rapidly (Van Hoof and De Pater, 1982: 36; Knippenberg, 2008: 61). This notion of 'standing in the footsteps of the American quantitative revolution' is informed by the biographical experience of a young generation of geographers arriving at the scene in the 1960s. The account of Dutch spatial science by one of these youngsters, Frans Dieleman (1942-2005), meticulously outlines the gradual adoption of quantitative and computational methods in the Dutch curriculum from the late 1960s onwards (Dieleman and Op t Veld, 1981). Dieleman and Op t Veld's 'latecomer narrative' is corroborated, albeit viewed pessimistically, by a towering figure of the previous generation: Christiaan van Paassen (1917-1996). Van Paassen was

present at the 1938 IGU conference in Amsterdam where he witnessed Walter Christaller present his central place theory. According to Van Paassen, Dutch geographers were unimpressed (Borchert, 1983; De Bruijn, 1984; Van Paassen, 1989)<sup>1</sup>. He was also present as the sole Dutch on the Urban Geography Symposium in Lund in 1960 that was central in the international diffusion of quantitative geography (Van Meeteren, forthcoming). Here he recalls he could hardly comprehend what the mathematically-oriented Americans were talking about (Van Paassen, 1989). Eventually, Van Paassen (in De Bruijne, 1984: 94) would lament the one-sidedness of the 'spatial paradigm' as it emerged in the 1970s. Thus, when both the Dutch quantifiers and its main detractor agree that The Netherlands was a latecomer to quantitative geography, we can consider the debate settled.

But then counter-narratives appear. Herman van der Wusten (2004: 49), who studied at the Municipal University Amsterdam (now University of Amsterdam) in the early 1960s, notes that Christaller had been part and parcel of the Amsterdam curriculum since at least the 1950s, and was considered 'okay but not particularly interesting'. He recalls his and his peers' surprise that in the USA, Christaller was all of a sudden hailed as something new and exciting. And once one starts digging in pre 1960s Dutch geography, one finds studies like Steigenga (1958) –who mentored Van Paassen at Utrecht university (Van Meeteren, 2020)– utilizing calculus to describe industrial decentralization tendencies in the Netherlands. This study is as sophisticated as the quantitative geography being contemporaneously written by William Garrison's tribe of quantitative revolutionaries at the University of Washington (Barnes, 2004). Dieleman and in t Veld (1981: 147) do allude to older Dutch quantitative work, but nevertheless dismiss it. Even Christiaan van Paassen turns out to have stimulated quantitative work in the 1960s. His former student Bert van der Knaap, another quantifying pioneer in the Netherlands, credits Van Paaasen as an important mentor challenging him to increase his quantitative skills<sup>2</sup>. Moreover, Van Paassen's own work from that era can hardly be considered 'descriptive regional geography' and has a profound theoretical sophistication (Van Meeteren, 2020).

That geography's historiography needs to understand the local context where history unfolds is by now accepted knowledge. Key episodes, such as the quantitative revolution or radical geography, articulate and mix with local traditions into profound variegation (Barnes and Sheppard, 2019; Van Meeteren and Sidaway, 2020). However, labels have effects. During the quantitative revolution in the US, several things came together: a rejection of an idiographic (individualizing) approach for a nomothetic (generalizing, theory forming) one, an adoption of quantitative methods, the introduction of computers to assist calculation, an adherence to some form of the hypothetico-deductive method, a significant expansion of higher education, and generational change (Burton, 1963; Gauthier and Taaffe, 2002; Morril, 1987; Van Meeteren, 2019a). The developments being described as 'revolution' signals that these changes took place during a short period. Elsewhere, some developments occurred earlier, did not occur at all, or were spread out over a longer period. However, once a revolution is called in one place, it can become a rallying cry in others. People adopt terms like 'the quantitative revolution' to describe their own project. To borrow a phrase from economic

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<sup>1</sup> Van Paassen's assessment will have been coloured by him being a student of the Utrecht School. Rotterdam's Willem Boerman, the main organizer of the 1938 IGU conference, was an early central place theory enthusiast (Boerman, 1933).

<sup>2</sup> Interview Bert van der Knaap 25-01-2020

geography, the idea of a 'quantitative revolution' as a stage through which geography evolves became performative (Barnes, 2008). Dutch geographers, both revolutionaries and counter-revolutionaries, performed the quantitative revolution, mimicking the language and framing they learned from anglophone textbooks. The Dutch experience is made equivalent to the American episode, backgrounding potential differences. We can surmise this is aggravated by the fact that the quantitative revolution came from the US, whose youth and consumer culture was strongly admired in the Netherlands of the 1950s and 1960s (Schuyt and Taverne 2004). As such, being dazzled by hegemony is often self-inflicted (Van Meeteren, 2019b). It might be the admiration of American achievement that make locals fawn at the American tradition while neglecting their own.

This chapter investigates this conundrum. How profound was this first wave of quantitative geography that Dieleman and in t' Veld mention, yet downplay? What things did change in the 1960s that made them experience a sense of revolution? The chapter draws on an extensive literature review, archival sources, and interviews and correspondence with involved Dutch geographers between September 2019 and December 2020. The chapter illustrates how an uncritical application from historiographical concepts and demarcations, such as the quantitative revolution, can render local histories invisible. Key is that this rendering was done by Dutch geographers, who were so immersed in the American hegemonic presentation that they overlooked curating their own tradition.

### **Rudiments: the antebellum**

Key to understanding Dutch geography is to comprehend its foundational parochial conflicts. In the Netherlands, an early decision was made in 1921 to split the human and physical geography curriculum (De Pater, 2001). After the split, the Amsterdam Municipal University and Utrecht University geography departments descended in a decades long rivalry of who was the true torchbearer of Dutch human geography (De Bruijne, 1984). This same 1921 decision pushed economic geography towards a subject in economics degrees (Lambooy, 1992). Willem Boerman (1888-1965, Figure 1), professor in economic geography, finds himself firmly established in Rotterdam's economics faculty. Boerman had been part of the losing faction opposing the human and physical geography split (Heslinga, 1983) and co-authored a book on 'physical and mathematical geography' (Blink and Boerman, 1919). Early on, Boerman (1926) developed innovative perspectives on relative space and a form of time space convergence, referring to Alfred Weber and classical location theory. He heralded Christaller's dissertation (Boerman 1933) and was notably entrepreneurial, catapulting his students in power broker research positions in the Dutch state apparatus (Van Meeteren, 2020). Boerman was well acquainted with Jan Tinbergen (1903-1994)<sup>3</sup>, a junior colleague in Rotterdam who would become a key player in Dutch economic planning and the inaugural winner of the Nobel prize in economics. Boerman was editor in chief of the *Tijdschrift voor Economische Geografie*<sup>4</sup> during the 1930s, 1940s and 1950s. Back then, TE(S)G was a practical alternative to the official journal of the Dutch Geographical Society (De Pater, 2009), and Boerman opened its pages to economic geography publications by practitioners, planners, economists, and engineers.

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<sup>3</sup> The correspondence between Tinbergen and Boerman preserved in the online archive 'The Tinbergen Letters' <https://tinbergenletters.eur.nl/theletters/> (last visited 5 October 2020) suggests both an intimate personal and professional relation.

<sup>4</sup> From 1948 onwards *Tijdschrift voor Economische en Sociale Geografie (TESG)*

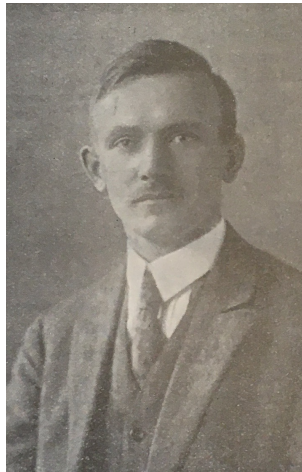


Figure 1. Willem Everhard Boerman (1888-1965), reproduced from Boerman (1930).

Pre-1960s innovations in Dutch human geography were driven by the discipline's engagement in spatial planning (Van Meeteren, 2020). Even before geographers got involved in the 1930s, the emerging Dutch planning profession was consumed by a rift between architects, focusing on aesthetics, and engineers, interested in surveying before plan (De Ruiter, 1980; Van der Valk, 1983). The engineers considered accurate demographic projections a key technique to estimate housing demand. Quantitative models from demography were adapted to the regional level to facilitate surveys for expansion plans. Importantly, these practical engineers toned down the Malthusian overtones and positivism in demographic models, favouring a more pragmatic "it gets the job done" epistemology (De Gans, 1999). A key player here was Theo van Lohuizen (1890-1956) who was responsible for the survey work or the general expansion plan of Amsterdam (1935) (Van der Valk, 1990). Van Lohuizen had proposed an export base model by the mid-1920s (De Smidt, 1967) to calculate housing prognoses based on estimating propulsive employment. This model (Van Lohuizen and Delfgaauw, 1935) was further developed together with economist (and trained economic geographer) Gerardus Delfgaauw (1905-1984) and gained widespread adoption (De Smidt, 1967). However, the statistics necessary to make the calculations were unavailable to make use of the model in the 1935 general extension plan of Amsterdam<sup>5</sup>, underlining how a quantitative revolution is contingent on the availability of reliable data.

As there were not enough engineers willing to do the survey work, this planning role is taken up by geographers in the 1930s (De Ruiter, 1983; Van Meeteren, 2020) who therefore become acquainted with this engineering and economist knowledge. The survey work produced by geographers in the 1930s was modelled on traditional regional geography (Stolzenburg, 1984) and mathematics was limited to descriptive statistics (Knippenberg, 2008), something commonly dismissed by engineers who lamented that geographers were unfocused and did too detailed unnecessary research in surveys (De Ruiter, 1983). Geographers most exposed to quantitative methods usually had no university position, and it was often in the practice of survey work that scholars from the rivalling academic factions mingled, collaborated and befriended one another (Kruijt, 1944). Meanwhile, these rivalries had become so intense that Amsterdam Municipal University professor Henri Nicolaas ter Veen (1883-1949) refused to

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<sup>5</sup> Interview GTJ Delfgaauw by Peter de Ruiter, 1981, (partial) transcript available at Archive: Het Nieuwe Instituut, Lohuizen, Th. K. (Theodoor Karel) van / Archief LOHUU25

participate in the 1938 IGU conference in Amsterdam that was organized by Boerman in cooperation with his Utrecht colleague Louis van Vuuren (1873-1951) (Heinemeyer in De Bruine, 1984: 109). Nevertheless, they joined forces when in 1941 they set up an inter-university research centre for applied research, the ISONEVO<sup>6</sup> (De Ruiter, 1983). Boerman, Van Vuuren and Ter Veen actively catapulted their students to government agencies for statistics and planning, particularly in the jobs that count. Johannes Verstege (1912-1992) a student of Van Vuuren would become responsible for the Dutch census at the Dutch Central Bureau of Statistics (CBS) before becoming director of that agency in 1967 (Het Parool, 1967). Future geography professors Hendrik Keuning (1904-1985) and Adriaan de Vooy (1907-1993) also worked at the CBS in the 1930s and 1940s (Knippenberg, 2008). Things accelerate when the Nazi occupiers instil a top-down planning model in the Netherlands in 1941. The new *Rijksdienst voor het Nationale Plan* (RNP) and *Provinciale Planologische Diensten*<sup>7</sup> again form an employment pool for Dutch geography students (Van Meeteren, 2020). Boerman's student George Zeegers (1911-1988) becomes director of research at the RNP (Boerman, 1951), where the groundwork is laid for post-war reconstruction (Van Meeteren, 2020). Perhaps the most iconic spatial legacy under German occupation is when Christaller's central place theory becomes instituted as a planning doctrine in the newly-reclaimed lands of the Noordoostpolder (Bosma, 1993), a doctrine which survives the war (Boyle et al., 2020: 94).

### **The first wave: Quantitative applied geography between 1945-1960**

Despite its controversial origins, the national planning institutions are largely retained after the end of the second world war. The rapid post-war reconstruction coincides with the forestalled modernization and automobilization of the country (Van Meeteren, 2020). The geographers working at the CBS had been part of a think tank, led by Jan Tinbergen, in the final stages of the war how applying mathematics could help in a government-led post-war reconstruction (Schuermans and De Vries, 1996: 20-21). This was reflective of an emerging technology-driven Fordist order in the post-war period where economic planning, mathematics, and computers were venerated (Schuyt and Taverne, 2004, Chapter 4). Geographers, albeit proximate to key players such as Tinbergen, were ambivalent.

In 1946, Zeegers (1946) publishes a lecture where he pleads to reform the educational program to make geographers ready for a career in planning. He notes that geographers bring a lot to the table for survey research to bridge abstract theoretical and concrete contextual knowledge. However, he does argue that geographers ought not to be trained as 'walking encyclopaedias of geographical facts' and develop a pragmatic and practical attitude to applied research. Around this time, two prominent central place studies are published. Keuning (1948), in one of his last publications as CBS employee before becoming the inaugural professor of Geography at the University of Groningen, publishes a Christaller-based central place categorization of the Netherlands. Also referring to Christaller is Amsterdam-trained Ch. A P Takes' (1948) study about the effect of the newly-reclaimed lands (the Flevopolders) on regional central place systems. Johan Winsemius (1910-1964), an Amsterdam-trained geographer who worked for the RNP in the 1940s and 1950s (Steigenga, 1964), publishes another important quantitative study (Winsemius, 1949). This study makes a complete survey

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<sup>6</sup> The acronym ISONEVO stood for "instituut voor Sociaal Onderzoek van het Nederlandse Volk, (translated as "Institute for Social Research of the Dutch People")

<sup>7</sup> The RNP's wartime record is a source of controversy which cannot be elaborated here for space constraints. Van Meeteren (2020) refers to the relevant literature.

of Dutch industrial geography applying Van Lohuizen's export-base method. Van Lohuizen himself is asked by the RNP to coordinate planning research, where he is to monitor that geography research does not become too expansive and remains relevant for planning applications (Van der Valk, 1990). Van Lohuizen, who had already been teaching planning at the Amsterdam Municipal University, becomes a part-time professor at the Technical University in Delft in 1946. Geographers of the various clans are invited to mingle with the engineers in this educational environment (De Ruiter, 1983), further hybridising practices.

Mass planning in post-war reconstruction meant a high demand for speedy survey work. In 1949, a controversial survey of the city of Amersfoort is published (Klaassen et al., 1949). The lead author, Leo Klaassen (1920-1992)<sup>8</sup> is a student of Tinbergen and employs novel econometric methods to regional planning. Willem Steigenga (1913-1974), in his role as economic researcher for the city of Rotterdam and editor of TESH, writes a balanced review (Steigenga, 1950), where he praises the study and admits that in the past, there was a lack of quantification, but he laments that the study excesses in "veneration of numbers", [...] there is too much iconoclasm, too little reform" (idem). In TESH, a debate between Klaassen, geographers and engineers (Klaassen, 1952, Van Aartsen, 1952, Angenot, 1952) ensues on the usefulness of quantitative methods to speed up the survey process. This debate is encouraged by editorial board (1952), that includes Boerman, Keuning, Steigenga, and Zeegers. The other geographer in the debate, Van Aartsen (1952) agrees with Steigenga that although quantitative methods are useful, they should not lead to empiricism and number fetishism. Likewise, then census director Verstege, in his inaugural lecture (Verstege, 1951) on 'social research and statistics' insists that mathematical research entirely modelled on the natural sciences will lead to an unjust society. Resultantly, social sciences need to alternate between generalizing and individualizing research. Similarly, In a Belgian lecture, Boerman (1950) lays out his philosophical foundations and argues that the central object of geographical research is understanding those relations, and processes that generate geographical difference, bringing him close to a nomothetic position. Steigenga pushes for a disciplinary emancipation, where geographers do not only supply background numbers for urban designers, but become 'social engineers' that develop theoretical models based on idealized theories of social change (Steigenga, 1957). Together, these examples show that in within the quantitative momentum of the 1950s, geographers were part of the conversation, but proposed a nuanced interplay of nomothetic and idiographic approaches to the interdisciplinary dialogue. Positioning the Dutch applied geography vanguard in the foundational debate of American 1950s geography, they were more bullish on nomothetic geography than Hartshorne was but surely not as radical against idiographic geography as Schaefer (Barnes and Van Meeteren, forthcoming).

Meanwhile, the Amsterdam geographers had come under the spell of American quantitative sociology that boomed during the early 1950s (Abbott and Sparrow, 2007). Many cast away their sociographical<sup>9</sup> identity and become the founding generation of modern Dutch sociology (Van Doorn, 1956). Consequently, quantitative sociological methodology, such as Lazarsfeld and Rosenberg's (1955) reader, is taught in the Municipal University Amsterdam geography curriculum from the mid 1950s. As regards institutionalization of quantitative methods in

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<sup>8</sup> Klaassen, together with Jean Paelinck would later become one of the leading figures of the Dutch chapter of the Regional Science Association (Lambooy, 1992).

<sup>9</sup> Amsterdam human geographers called themselves 'sociographers' in this era (see De Bruijne, 1984).

education, the Municipal University was more than a decade ahead of the other Dutch departments. This explains Herman van der Wusten's (2004) surprise about the revolutionary fuss coming out of the US, it had been their standard undergraduate curriculum way before Bill Bunge came barging in claiming unprecedented change in geographic thought<sup>10</sup>.

Meanwhile, more intense use of numbers slowly became overwhelming for practical research. The correspondence between Steigenga, Winsemius (geographers), Angenot, and Van Lohuizen (engineers) on how to best calculate the concentration numbers for the export base studies for the RNP have been preserved. The hand written proofs of theorem and counter-calculations span a hefty stack of paper<sup>11</sup>. The absence of computers in the Dutch 1950s social science context did seem to cap the quantitative momentum. In the 1958 lecture commemorating his retirement<sup>12</sup>, Boerman nevertheless argues that geographers and economists will need to work more closely together and that geographers have to master quantitative methods. He hopes his successor will have the proficiency to make that happen.

To conclude, in the first wave, it were particularly applied geographers who were engaging with quantitative methods, in a context where these were pushed by economists and engineers. Because geographers had become part of these networks in government research agencies in the 1930s and 1940s, they were in the position to plead for a nuanced geographical perspective on the use of these numbers. This mediating role of geography in qualified adoption of quantitative methods is distinctive from the US-based narrative (Barnes, 2004; Burton, 1963) of geography's quantitative revolution.

### **The second wave: Dutch geography in the 1960s**

Whereas most action on the quantitative geography front in the 1950s was outside academia, the early sixties finally see the applied geographers breaking in as new geography and planning institutes are staffed<sup>13</sup>. The ISONEVO is succeeded by the SISWO, the Inter-university Institute for Social-Scientific Research<sup>14</sup> in 1960 (Kouwe, 1985). SISWO would become a key marginal space (Lorimer and Spedding, 2002) for the development of quantitative geography in the Netherlands. SISWO's ranks are prominently filled with associates and students of the applied geography community (Kouwe, 1985). One of the earliest research topics SISWO sponsors is a large inter-university research programme on the future of inner cities. Project teams were formed spanning the boundaries between geography and economics and the different rivalling schools of geographers (idem: 6).

Now that geographers from different tribes that worked together in applied projects in the 1950s get university positions, the historical rivalries start to dissipate. Steigenga, an Utrecht geographer, becomes inaugural professor in spatial planning in Amsterdam, unthinkable a few years earlier (Van der Valk, 1983). Informal inter-university networks around SISWO and

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<sup>10</sup> Interview Herman van der Wusten 12-09-2019.

<sup>11</sup> Archive: Het Nieuwe Instituut, Lohuizen, Th. K. (Theodoor Karel) van / Archief LOHUd231

<sup>12</sup> Archive: M W Heslinga, Collectie HDC Protestantse Erfoed nr 194, Vrije Universiteit Amsterdam, folder 165.

<sup>13</sup> The University of Nijmegen starts a geography programme in 1958, The Free University Amsterdam in 1961, (De Pater, 2001); The Municipal University in Amsterdam starts the first department in urban and regional planning (Planologie) in 1962 (Van Meeteren, 2020).

<sup>14</sup> Interuniversitair Instituut voor Sociaal-Wetenschappelijk Onderzoek

inter-university study groups on human geography emerge. In these circles, the latest theoretical developments in Anglophone geography are discussed (e.g. Bours et al. 1964).

During the mid 1960s, Dutch geography is increasingly in dialogue with the Anglophone literature in geography and regional science, and authors like Haggett are actively debated in student circles<sup>15</sup>. Lambooy (1966) publishes a prize-winning article where he insists on coupling local theories with the latest English-language literature to rejuvenate regional geographical thinking. A modernized TESSG publishes articles by young Anglophone quantifiers such as Leslie King (1962), Kevin Cox (1965), Wayne Davies (1965), Peter Gould (Gould and Leinbach, 1966), and Ron Johnston (1966). TESSG was a safe haven for spatial science at a time when the anglophone journals were reluctant to publish quantitative and theoretical geography (Barnes, 2004)<sup>16</sup>.

Inner city research, which had been independently continuing at Amsterdam Municipal University<sup>17</sup> intensified engagement with urban geographical theory (Heinemeyer et al., 1967: Preface). The 1964 IGU conference sets off a chain of events tying-in Dutch geography internationally. Based on contacts developed with Torsten Hägerstrand and others<sup>18</sup>, the Amsterdam Municipal University organises in 1966 an international conference on 'urban core and inner city' (Heinemeyer et al., 1967) featuring Hägerstrand, Peter Hall, Allan Pred and Gunnar Olsson. Herman van der Wusten, still a student-assistant at the time, recalls that Olsson subscribed them to the mailing list of the underground MICMOG mimeographed working papers<sup>19</sup> (Barnes, 2004). In the slipstream of these contacts, Van Paassen spends time as a visiting professor in Lund<sup>20</sup>, Sweden, the start of a lifelong friendship with Torsten Hägerstrand (Van Meeteren, 2019c).

While the curriculum and networks internationalize, geography enters a period of rapid expansion. During the 1950s and early 1960s, geography and planning departments were still cosy small-scale affairs and growth in geography students had been cushioned by the establishment of new departments (De Pater, 1999: 21). Although institutes were somewhat hierarchical, they were also organized informally: there was no study guide, people would just wander in and out of lectures<sup>21</sup>. From the mid-1960s onwards, departments slowly started growing and professionalize, a development that would accelerate in the 1970s (De Pater, 1999: 29). When the student numbers increased, there was scope to hire new staff and deepen the division of labour among staff. SISWO was a particularly popular venue to acquire staff from. Gerard Hoekveld (1934-2011) was hired from SISWO by the Amsterdam Free University in 1967 (De Pater, 1998). SISWO's director, Piet Kouwe (1928-1997), would eventually become professor in quantitative methods in Nijmegen in 1969 (Kouwe, 1988).

When departments expanded, quantitative skills became a hiring criterium. Marcus Heslinga (1922-2009) (Kouwenhoven, 1984: 60), the leading professor of human geography at

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<sup>15</sup> Herman van der Wusten, personal communication 16-12-2020.

<sup>16</sup> Kevin Cox, personal communication 17-02-2018.

<sup>17</sup> Michel van Hulten, personal communication 10-09-2020;

<sup>18</sup> Michel van Hulten, personal communication 10-09-2020.

<sup>19</sup> Interview Herman van der Wusten 12-09-2019, personal communication 15-12-2020.

<sup>20</sup> Letter Van Paassen to Hägerstrand 18-02-1966. Torsten Hägerstrand papers, University of Lund, Box 42.

<sup>21</sup> Interviews Herman van der Wusten 12-09-2019, Jan Lambooy, 13-09-2019, Jan van Weesep, 29-09-2019.



Amsterdam's Free University, had first-hand witnessed the generational culture war that quantitative geography engendered in the UK. He encouraged his new hire Hoekveld to embrace quantitative geography wanting prevent inter-generational rifts. In Utrecht there was a similar 'peaceful' adoption where newly hired staff members were encouraged to travel and learn quantitative methods from abroad.

Junior staff members (Jan Lambooy at the Free University) or even student-assistants (Joost Hauer and Bert van der Knaap in Utrecht) were assigned statistics teaching because they had affinity with quantitative methods. The Utrecht student-teachers are able to secure access to the university's Elektrologica EL X 8 computer where the first computational experiments in Dutch geography are conducted in the late 1960s<sup>22</sup>. The quantitative momentum was further stimulated through visiting scholarships to the US, particularly at Amsterdam's Free University. Gerard Hoekveld, travels the US in 1967 and becomes convinced of the quantitative momentum (De Pater, 1998). He then stimulates his assistants to apply for scholarships<sup>23</sup>. His student Frans Dieleman follows in the same year, starting a lifelong friendship with William Clark at Wisconsin-Madison (Clark, 2005). Two years later, Jan van Weesep travels to Wisconsin-Madison in Dieleman's footsteps. In the US, they do not only learn the importance of utilizing computers, they also get socialized in the American narrative about the quantitative revolution as a fundamental break in geographical scholarship. When the Free University scholars return, it is with a firm conviction about the American quantitative revolution, and the key role learning computer programming plays in this<sup>24</sup>. In the same period, Utrecht University's Joost Hauer conducts visits to study quantitative geography curricula in Lund (with Torsten Hägerstrand) and Göteborg (Olof Wärneryd) in 1968 and to Bristol (with Peter Haggett and David Harvey) in 1969<sup>25</sup>.

Meanwhile, Dutch geography and planning departments actively started to recruit for mathematical chops outside the geographical discipline. In Amsterdam, Anneke Hakkenberg, a mathematician who previous worked at a physics institute is hired by Steigenga in 1967 to teach quantitative methods (Figure 2). Steigenga handed her a copy of Peter Haggett's *Locational Analysis in Geography* (1965) with the expectation to integrate linear programming in the spatial planning curriculum<sup>26</sup>. At the Amsterdam Free University, convinced by what he saw in the US, Gerard Hoekveld also pushes to hire a mathematician, Rinus Deurloo in 1968, to further professionalize quantitative methods teaching<sup>27</sup>.

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<sup>22</sup> Joost Hauer, personal communication 15-09-2020; Interview Bert van der Knaap 25-01-2020

<sup>23</sup> Interview Jan Van Weesep 29-09-2019

<sup>24</sup> Interview Jan Van Weesep 29-09-2019; Interview Rinus Deurloo 28-01-2020.

<sup>25</sup> Joost Hauer, personal communication 15-09-2020

<sup>26</sup> Interview Anneke Hakkenberg 26-01-2020.

<sup>27</sup> Interview Rinus Deurloo 28-01-2020.



Figure 2. A newly hired Anneke Hakkenberg (3rd right, seated) discusses spatial models at Willem Steigenga's (left) young planning institute at Amsterdam Municipal University. A (staged) 1967 or 1968 promotional photo showcasing the institute's ambition to immerse in applied quantitative geography. (Source: Van der Valk, 1983: 118, reproduced with permission)

In the late 1960s, SISWO decides to bring together all the methods teachers in the Dutch academic social sciences to exchange teaching notes and ideas. This meeting helps ignite a spark that ultimately leads to the formation of an 'inter-university working group of quantitative methods' in 1968 (Kouwe, 1985). In this working group, the young Dutch quantitative geographers would frequently come together, organized by Ad Goethals (1940-2007), a former student of Anneke Hakkenberg who after graduation was hired by SISWO. It is the experience of this SISWO group that organizes a study day in 1971 (Dieleman et al., 1971), that largely informs Dieleman and Op t Veld's (1981) account of Dutch spatial science.

The SISWO working group starts out as a bi-monthly reading group, where they would read the latest handbooks on quantitative geography which were rapidly being published in the UK and US. After discussing Peter Haggett's work as a baseline<sup>28</sup>, they would read Leslie King's *Statistical Analysis Geography* (1969), David Harvey's *Explanation in Geography* (1969), and Adams, Abler and Gould's *Spatial Organization* (1971)<sup>29</sup>. Inspired by these books and his travels, Hauer's (1971) summary of quantitative geography largely follows this Anglo-American reading of the "quantitative revolution".

<sup>28</sup> Interview Anneke Hakkenberg 26-01-2020

<sup>29</sup> Interview Bert van der Knaap, 25-01-2020; Joost Hauer, personal communication 15-09-2020

Apart from working through handbooks, they helped one another mastering methods and computer programming.<sup>30</sup> The group also contributes to a research project on 'economic health' of regions (see Van der Knaap, 1971), utilizing the latest in computational techniques. Rinus Deurloo recalls that it was somewhat of a 'proof of concept' exercise to show the wider geographical community what analytical worlds would open through these computational methods<sup>31</sup>.

The early years of the SISWO working group, which would survive for decades, coincide with seismic shifts at Dutch universities. As the result of student uprisings, particularly the occupancy of the executive building of the Amsterdam Municipal University in 1969, the university governance system is radically reformed (Schuyt and Taverne, 2004: 299-304). The power of the professor as sole decider of the curriculum gets replaced by a democratic system where the student body obtains a significant voice. This democratisation of universities is a generational watershed for university staff. The young quantifiers are better able to identify and cope with new student demands. And, as Hauer (1994: 698) recalls, quantitative geography felt for them as a way to 'break through' the hierarchies as the senior professors did not 'get' the language of formal mathematical models. Meanwhile, it is the older generation, such as Steigenga and Van Paassen, who face difficulty adapting to the new situation. Having themselves grown up in small-scale mentoring relationships between professor and prodigy, they now all of a sudden face masses of students determining what they have to teach. Whether fair or not, these professors were perceived by students, as exactly the kind of institutions that they were revolting against<sup>32</sup>. Then, from the early 1970s onwards, the Anglophone quantitative new geography steadily diffused, including computational methods, along Dutch universities as meticulously set-out by Dieleman and in 't Veld (1981).

## Discussion

The above narrative essentially tells a story of continuity and change. There developed a first wave of innovative Dutch quantitative geography with theoretical sophistication in the 1950s, in the realm of applied post-war reconstruction research. This wave was ultimately limited by the unavailability of modern computation and insufficient uptake at universities. Because it was applied, many publications never escaped the world of government reports and only incidentally made an international splash. Dutch academic geography in the 1950s, meanwhile, has been described as 'splendid isolation' where institutes in conflict primarily tended to their own projects and were reluctant to publish (Van Ginkel, 1994). Moreover, some did not think highly of what happened in the applied world, and there were serious conflicts whether this planning work was really worthy of academic geography (De Pater, 1999: 110). This all helps explain why the earlier 1950s innovations are so poorly documented. The most prominent pioneer, Willem Boerman, was a professor at an economics faculty that went against the human-physical geography split regarded emblematic of Dutch geography (De Pater, 2001) making him difficult to fit into Dutch geography's self-narrative. Moreover, much progress was made in marginal spaces outside the ivory tower such as SISWO whose achievements get lost in the interdisciplinary archival void. When a rejuvenated push for

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<sup>30</sup> Interview Rinus Deurloo 28-01-2020.

<sup>31</sup> Interview Rinus Deurloo 28-01-2020.

<sup>32</sup> Interviews Herman van der Wusten 12-09-2019, Jan van Weesep, 29-09-2019; Arnold van der Valk 09-10-2020; see also Van der Valk (1983).

quantification arrives in the mid-1960s, it largely follows - performs - the scenario set out in the Anglophone textbooks.

Rhetoric aside, it is nevertheless important to note that despite obvious American influence, some of the first wave sensibilities, including its healthy scepticism on the limits of quantification, did reproduce themselves. Both Joost Hauer (1967) and Anneke Hakkenberg (1969) published scathing reviews of Peter Haggett's (1965) *Locational Analysis in Geography*. Hakkenberg (1969), as trained mathematician, points out that the kind of theoretical inferences made by Haggett cannot be backed up by his amateurish mathematics. In her article she dismisses the naive empiricism of Zipf and Social Physics and pours cold water over many of the ontological claims of quantitative geography. Although Hakkenberg acknowledges her position was more purist than that of the other SISWO working group participants<sup>33</sup>, Van der Knaap also recalls that for him, mathematics always remained a means to an end. It had to be subservient to theoretical ideas that underpinned the operationalization of research problems<sup>34</sup>. It is telling that the Dutch quantifiers eventually adopt a Belgian term for the quantitative revolution: 'the new orientation in geography' (e.g. Van Hoof & De Pater, 1982), based on their (SISWO induced) contacts with Ghent geographer Pieter Saey. Saey (1968) formulated his new orientation in a clear admiration of American spatial science, but like Lambooy (1966), he did so in a way that was consistent and compatible with the relational and theoretical schemas developed by people like Boerman and Van Paassen. When Piet Kouwe, hired from the SISWO in 1969 to Nijmegen to introduce quantitative methods, held his retirement speech in 1988, he called the quantitative momentum of the 1960s and 1970s a "methodological intermezzo". An intermezzo that modernized Dutch human geography, but ultimately reached its limits and was subsumed in a continuing pragmatic, pluriform and applied geographical tradition (Kouwe 1988).

To conclude, the Dutch first wave 1950s quantitative turn was not a revolution. Compared to the US, it was more gradual and incomplete. The US's 1950s expansion of the university system that had fuelled the original quantitative revolution (Van Meeteren, 2019a) only started happening in the Netherlands in the 1960s. Likewise, the Netherlands was late in introducing computers to geographical research. The social revolutionary developments of 1968 and 1969 radically reformed the social relations at university and would contribute to the fading away of the pedagogy of 'catalogues of geographical facts' (Van Westrhenen and Dijkink, 1982). Thus, there are plenty of revolutionary changes that happened in the Dutch geography in the 1960s that make it feel like the country was standing in the footsteps of the US. Yet ironically 'quantitative and theoretical' approaches of geography, that are sometimes argued to be the core of the revolution (Morris, 1987) were not. The theoretical implications of mathematical practice in geography and the tension between idiographic and nomothetic research had been digested in the first wave already. Moreover, sensibilities learned in the first wave did trickle down in the second, making that when Dutch quantitative geography was finally codified in a textbook, it hardly had a strong positivist theoretical signature (Hauer and Van der Knaap, 1973). For better or for worse, it is historically false to say that Dutch quantitative geography stands in the footsteps of the American quantitative revolution.

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<sup>33</sup> Interview Anneke Hakkenberg 26-01-2020

<sup>34</sup> Interview Bert van der Knaap 25-01-2020

Nevertheless, It is undoubtedly the case that the enormously influential Anglo-American quantitative stepped on Dutch geography and made a daunting impression.

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