8 Religion and the Laboratory Revolution: Towards a Physiological Laboratory at a Calvinist University in the Netherlands, 1880–1924

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Abstract
Originally orthodox Christians were ambivalent about the modern research laboratory, which many of them dismissed as a symbol of 'materialism' and disbelief. It was only in 1918 that the Calvinist Vrije Universiteit in Amsterdam established its first laboratory, for physiology, and F.J.J. Buytendijk became the first professor of physiology. Although it was precisely in the chosen field of animal psychology that some distinctive, Christian emphasis could be placed, the most important consequence of this step was that the university was more than before adapting to what was already customary elsewhere. It turned out that the foundation of the laboratory instigated the Vrije Universiteit's own 'laboratory revolution'.

Keywords: Laboratory, religion, Neo-Calvinism, animal psychology, F.J.J. Buytendijk

Introduction

Over the course of the nineteenth century, the laboratory came to be seen as a symbol of scientific progress and innovation. Initially its role was restricted to the fields of chemistry and pharmacy, but in the second half of the century, laboratory work acquired significant authority in medicine as well. It was in the laboratory, proponents believed, that medicine finally seemed to find a scientific basis. The experimental method promised to

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open the way to a golden future for medicine, and the laboratory was the right place for it.[1]

However, the laboratory also carried a more negative image. Especially in religious circles, it was often seen as a symbol of 'materialism' and disbelief. After all, medicine was practised in a fundamentally reductionist way in the laboratory. This was especially true of new forms of experimental physiology, which had captured a place in Germany around the middle of the century (championed by Carl Ludwig, Emil du Bois-Reymond, and others) and for which specialized laboratories were built. A characteristic of this work was the disappearance of a fundamental distinction between life and non-life. In the reductionist approach, there was no longer any room for teleological and vitalist principles or something like a separate life force. Everything, including features of living entities, had to be explained in terms of physico-chemical processes. Pathological research, based on cell theory, also found its way into the laboratory, where it was mainly based on intensive microscopic research, as advocated by Rudolf Virchow. This new anatomy therefore also possessed a reductionist character.[2]

All this was accompanied by a great increase in vivisection, animal experiments. This caused a backlash from both anti-vivisectionists and some religious groups. The 'vivisector in the lab' was sometimes compared to a new priest of science, the laboratory the temple, and animal experimentation a 'sacrificial rite demanded by the false god of a pseudo-religion'.[3] And nineteenth-century life sciences and medicine generally seemed to blur the lines between humans and animals. This primarily followed from the theory of evolution and eventually led to extensive research into animal behaviour and the animal psyche. Around 1900 comparative psychological research with laboratory animals took off in full force.[4]

1 On the nineteenth-century laboratory revolution in medicine: Andrew Cunningham and Perry Williams, eds., *The Laboratory Revolution in Medicine* (Cambridge: Cambridge University Press, 1992); William F. Bynum, *Science and the Practice of Medicine in the Nineteenth Century* (Cambridge: Cambridge University Press, 1994), pp. 92–117 and Frans van Lunteren's chapter in this volume.

2 Lynn K. Nyhart, *Biology Takes Form: Animal Morphology and the German Universities, 1800–1900* (Chicago/London: University of Chicago Press, 1995), pp. 67–90; Richard L. Kremer, 'Physiology' and Russell C. Maulitz, 'Pathology', in Peter J. Bowler and John. V. Pickstone, eds., *The Modern Biological and Earth Sciences. The Cambridge History of Science, vol. 6* (Cambridge: Cambridge University Press, 2009), pp. 342–66, 376–81; cf. Frederick Gregory, *Scientific Materialism in Nineteenth Century Germany* (Dordrecht: Reidel, 1977), pp. 164–88.

3 Chien-hui Li, 'Mobilizing Christianity in the Antivivisection Movement in Victorian Britain', *Journal of Animal Ethics*, 2 (2012), 141–61 (p. 151).

4 Judy Johns Schloegel and Henning Schmidgen, 'General Physiology, Experimental Psychology, and Evolutionism: Unicellular Organisms as Objects of Psychophysiological Research, 1877–1918',

Starting in Germany, the new laboratory medicine was also able to conquer its place in the Netherlands, starting with the appointment of a new generation of professors of physiology and the construction of associated laboratories at the universities. This started in Groningen, with the appointment in 1851 of Izaac van Deen. Elsewhere—Amsterdam, Utrecht, Leiden—physiology also conquered its independence, with its own laboratories in which research was conducted on a reductionist basis.[5]

When the Vrije Universiteit ('Free University'; VU), a university with a distinctive Calvinist identity, opened its doors in Amsterdam in 1880, it was faced with the question of what to do with this 'materialistic medicine'. A decision did not have to be made immediately, because the VU initially included only three faculties: theology, the arts, and law. Discussions, deliberations, and pondering would take place over several decades, but in 1907 the first medical professor was appointed, and a clinic was opened three years later. In 1918 the first—physiological—laboratory followed.

This chapter is a case study of how orthodox Christians related to the laboratory revolution in medicine. Which considerations guided discussions within the VU, and what did this Christian university have to offer against the 'materialism' of laboratory science? Answering these questions may provide insight into the role of the laboratory in the science–religion debate of the early twentieth century.

Plans for a Medical Faculty at the Vrije Universiteit

Although the VU had started with three humanities faculties, the absence of two complementary faculties, those for medicine and the natural sciences,

Isis, 93 (2002), 614–45; Robert A. Boakes, *From Darwin to Behaviourism: Psychology and the Minds of Animals* (Cambridge: Cambridge University Press, 1984); Michael Pettit, 'The Problem of Raccoon Intelligence in Behaviourist America', *The British Journal for the History of Science*, 43 (2010), 391–421.

5 H. Beukers, 'Een nieuwe werkplaats in de geneeskunde: de opkomst van laboratoria in de geneeskundige faculteiten', *GEWINA / TGGNWT*, 9 (1986), 266–77; C.A. Pekelharing, 'De physiologie in Nederland in de laatste halve eeuw', *Nederlandsch Tijdschrift voor Geneeskunde*, 50 (1907), 8–19; Stefan van der Poel, *Tussen zieken, boeken en kikkers. De fysiologie van een leven: Izaac van Deen (1804-1869)* (Groningen: Barkhuis, 2012); Stefan van der Poel, '"Doch deze onderscheidt zich op eene eervolle wijs." Izaac van Deen (1804-1869): de eerste Joodse hoogleraar in Nederland', in L.J. Dorsman and P.J. Knegtmans, eds., *De menselijke maat in de wetenschap: De geleerden(auto) biografie als bron voor de wetenschaps- en universiteitsgeschiedenis* (Hilversum: Verloren, 2013), pp. 74–97; Laurens de Rooy, *Snijburcht: Lodewijk Bolk en de bloei van de Nederlandse anatomie* (Amsterdam: Amsterdam University Press, 2011), pp. 30–43.

both necessary to form a 'full' university, was discussed since its foundation. Its most prominent founder and first rector, Abraham Kuyper (1837–1920), delivered an inaugural speech on 20 October 1880, in which he outlined the ideal of a complete university with five faculties. Kuyper wanted 'a separate scientific development' not only for theology but for all academic fields. In Kuyper's view, one's religious starting point makes a difference in all fields of science and scholarship. In medicine, Kuyper stated, Christian researchers believe that 'it is not a sick mammal that medical science would help, but a person created in the image of God'.[6] The aim of the VU was therefore to develop a Christian science and scholarship, founded on the so-called Calvinist principles. Medical research would be shaped differently than elsewhere. For the faculty of medicine, this implied that it could not restrict itself to clinical work and training Christian doctors, however important these tasks might have been. The basic scientific research topics also had to be given a place, precisely because of the perceived virulent materialism at the other universities that manifested in these fields. This stance is characteristic of Kuyper's so-called neo-Calvinist view of science. This philosophy of science had a radical character and differed from, for example, the approach to science among kindred Calvinists in the Anglo-Saxon world, who advocated a shared common-sense epistemology between Christians and non-Christians.[7]

The 'Society for Higher Education on the Basis of Reformed Principles' (*Vereeniging voor Hooger Onderwijs op Gereformeerden Grondslag*) was responsible for and governed the VU through a board of directors (elected in the general meeting of the Society). A board of curators (appointed by the directors) supervised the work at the university. The Society was also the channel through which the relation between the VU and its Calvinist constituency was maintained. This was important because the university could not survive without its supporters. In this period it was not funded by the government and remained completely dependent on donations.

6 Abraham Kuyper, *Souvereiniteit in eigen kring. Rede ter inwijding van de Vrije Universiteit* (Amsterdam 1880), p. 33. Translated as: Abraham Kuyper, 'Sphere Sovereignty', in James Bratt, ed., *Abraham Kuyper: A Centennial Reader* (Grand Rapids, MI: Eerdmans, 1998), pp. 463–90 (p. 487).

7 The literature on Kuyperian, neo-Calvinist philosophy of science include: Jacob Klapwijk, 'Abraham Kuyper on Science, Theology and University', *Philosophia Reformata*, 78 (2013), 18–46; Del Ratzsch, 'Abraham Kuyper's Philosophy of Science', in Jitse M. van der Meer, ed., *Facets of Faith and Science,* 4 vols. (Lanham, MD: University Press of America, 1996), vol. 2: *The Role of Beliefs in Mathematics and the Natural Sciences: An Augustinian Perspective*, pp. 1–32; Ab Flipse, *Christelijke wetenschap. Nederlandse rooms-katholieken en gereformeerden over de natuurwetenschap, 1880-1940* (Hilversum: Verloren, 2004), pp. 52–9.

The neo-Calvinist scientific ideal was guarded by the university's administrators—the directors and curators—while professors were expected to integrate these norms and values in their own work.[8]

The curators noted as early as 1881 that the appointment of a medical professor was a very pressing need, especially for teaching anthropology, psychiatry, and physiology, because of 'the unlimited influence of materialism in those subjects at the state universities'.[9] Two years later, they informed the directors that the establishment of a medical faculty was urgently needed.[10] However, two problems arose: firstly, there was a lack of suitable candidates, and secondly, the expense of such a faculty, with all its facilities, instruments, and laboratories, would far exceed the costs of the three existing faculties.

In 1888 the curators met specifically to discuss the minimum requirements for founding a medical faculty. Starting with a single professor was seen as pointless. After all, several subjects were considered as important: anatomy, physiology, anatomical pathology, therapy, and psychiatry. The battle against materialism needed to be waged across the full range. Moreover, it was clear that no suitable candidates would be available. As the curators put it: 'Whence do we acquire a Virchow?', meaning, of course, a Christian version.[11]

These problems were also underlined by Abraham Kuyper himself in a speech to the general meeting of the Society in 1891. It was not merely a matter of appointing a professor who was only good at microscopy or anatomy, Kuyper stated. After all, a different kind of science had to be built up, precisely in those areas that were 'in the hands of materialists'. Nor should the university start—as had been suggested—with a psychiatrist. Ideally one would first deal with physiology and pathology, 'which explains

8 Arie van Deursen, *The Distinctive Character of the Free University Amsterdam, 1880–2005: A Commemorative History* (Grand Rapids, MI: Eerdmans, 2008), pp. 9–14.

9 Minutes meeting curators, 7 January 1881, Amsterdam, VU, Curators' Archives: 'de onbegrensde invloed van het materialisme in die vakken aan de staatsuniversiteiten'. In the near future, the VU Archives will be moved to the Amsterdam City Archives, where they will be available for consultation. What follows in this paragraph is partly based on: Leo van Bergen, *Van genezen in geloof tot geloof in genezen. De medische faculteit van de Vrije Universiteit, 1880-2000* (Diemen: Veen Magazines, 2005), pp. 59–92; Mart J. van Lieburg, *Barmhartigheid en wetenschap. De onvoltooid verleden tijd van de Faculteit Geneeskunde VU* (Amsterdam: Vrije Universiteit, 1990); J.C. Rullmann, *De Vrije Universiteit. Haar ontstaan en haar bestaan 1880-1930* (Amsterdam: De Standaard, 1930), pp. 159–74.

10 Minutes meeting curators, 15 January 1883, Amsterdam, VU, Curators' Archives.

11 Minutes meeting curators, January 1888, Amsterdam, VU, Curators' Archives: 'van waar bekomen wij een Virchow?'

the origin of disease, because it is precisely in this area that the materialists are diametrically opposed to the Holy Scriptures'. The next step could then be the appointment of a psychiatry professor because of this field's focus on the relationship between body and soul.[12]

The Rotterdam doctor Th.G. den Houter emphasized this strategy in a brochure from 1895 on 'Medical science and the Vrije Universiteit'. He too emphasized 'the materialist nature of medicine' and the fact 'that man was regarded as a mammal' at other universities.[13] Like Kuyper, Den Houter was also critical of what he considered to be unnecessary, unbridled vivisection. After all, such experiments, in which animals were tormented and tortured, gave only limited insight into the sick patient and, even worse, trained students to be cruel instead of caring, an attitude which would push them towards atheism.[14] He pointed to the fundamental science subjects as the place where 'the evil of materialism' was already being sown. Den Houter pragmatically suggested starting with a chair for history, philosophy, and encyclopaedia of medicine, precisely because the foundation of laboratories seemed unattainable for the time being.[15] Despite hesitation, financial hurdles, and different opinions about the proper first steps, in the first decades following the VU's foundation, the shared conviction of all those involved was that one day, the university should comprise a complete medical faculty with its own laboratories.

In this endeavour the VU also followed the pattern of other confessional, mainly Catholic, universities outside the Netherlands. When the Catholic university of Freiburg (Fribourg), Switzerland began establishing a medical faculty in 1893, Kuyper set this as an example for the VU's supporters: 'What is now going on in Freiburg once more calls us to action."[16] Kuyper might also have mentioned the Catholic University of Leuven in Belgium,

12 'Is de aanstelling van een hoogleeraar in de Psychiatrie geraden, zoolang de Medische faculteit als zoodanig niet is ingesteld?' *Twaalfde Jaarverslag van de Vereeniging voor Hooger Onderwijs op Gereformeerde Grondslag* (Amsterdam: 1892), pp. XXXVII–XLII: 'die de oorsprong der ziekte verklaart wijl juist daarin de materialisten lijnrecht ingaan tegen de Heilige Schrift.'

13 Th.G. den Houter, *De medische wetenschap en de Vrije Universiteit* (Leiden: Donner, 1895), pp. 12–13.

14 Den Houter, *De medische wetenschap*; A. Kuyper, 'Uit de pers', *De Heraut*, 2 November 1890; cf. Amanda Kluveld, *Reis door de hel der onschuldigen. De expressieve politiek van de Nederlandse anti-vivisectionisten, 1890-1940* (Amsterdam: Amsterdam University Press, 2000), pp. 168–72.

15 Den Houter, *De medische wetenschap*, pp. 26–8. Cf. M.J. van Lieburg, 'Reformatorische traditie, geneeskunde en geneeskunst. Enkele historische kanttekeningen', *Beweging*, 48 (1984), 67–70 (p. 69).

16 Abraham Kuyper, 'Medische faculteit', *De Heraut*, 3 September 1893: 'Wat thans te Freiburg gaande is, brengt ons weer een roepstem, die tot handelen prikkelt.'

where all sorts of laboratories were being built during these decades.[17] In the Netherlands a Catholic university (in Nijmegen) was not established until 1923, with a medical and science faculty being added only after World War II. However, the tensions at these Catholic universities were not as great as they were at the VU, because the ideal of a 'Catholic science' was not considered as the main duty of the faculties, as historian Geert Vanpaemel writes in his book about the Leuven science faculty.[18] The neo-Calvinist ideal of a Christian science was more radical than this Catholic implementation. And it remained vital during the foundation and expansion of the VU.

During the first 25 years of its existence, the VU did not take concrete steps towards founding a medical faculty. It was only through collaboration with the Association for Christian Care for the Insane and Neurotics (*Vereeniging tot Christelijke Verzorging van Krankzinnigen en Zenuwlijders*) that the first professor of medicine would be appointed in 1907. The objective of this Association, which already administered several clinics in the Netherlands, was slightly different from that of the VU. The training of Christian psychiatrists was their primary concern. The Association had repeatedly urged the VU to create a chair of psychiatry. In 1907 the collaboration between the VU and this Association led to the appointment of Leendert Bouman (1869–1936) in a joint position as professor at the VU and as medical director of a newly built clinic. Whereas the three existing faculties of the VU were housed in a converted ancient canal house in the city centre, this psychiatric-neurological clinic was built in the new neighbourhood Amsterdam-Zuid at the Valeriusplein. The clinic was officially opened on 3 November 1910; it was later called the Valerius Clinic (Valeriuskliniek).[19] Although the Association provided for the costs of the clinic, the expenses for the VU also rose sharply. However, it was precisely during this period that the VU came into possession of wealthy pastor C.L.D. van Coeverden Adriani's (1843–1911) estate. A foundation in his name provided the funds

17 Geert Vanpaemel, *Wetenschap als roeping. Een geschiedenis van de Leuvense faculteit voor wetenschappen* (Leuven: Lipsius, 2017), p. 95.

18 Vanpaemel, *Wetenschap als roeping*, p. 91. See also: Flipse, *Christelijke wetenschap*, pp. 126–8.

19 On the history of the Association for the Christian Care for the Insane, and of the Valerius Clinic, see: G.A. Lindeboom and M.J. van Lieburg, *Gedenkboek van de Vereniging tot Christelijke Verzorging van Geestes- en Zenuwzieken 1884-1984* (Kampen: Kok, 1984); W.J. Wieringa, 'Lotgevallen van de Valeriuskliniek', in W.J. Wieringa, ed., *Een halve eeuw arbeid op psychiatrisch-neurologisch terrein, 1910-1960. Gedenkboek uitgegeven ter herdenking van het vijftigjarig bestaan van de Valeriuskliniek te Amsterdam uitgaande van de Vereeniging tot christelijke verzorging van geestes- en zenuwzieken in Nederland* (Wageningen: Zomer en Keuning, [1960]), pp. 11–87.

Figure 8.1 On the left: the Psychiatric-Neurological Clinic (*Valeriuskliniek*) in Valeriusplein in Amsterdam-Zuid, which opened in 1910. On the corner: the Physiological Laboratory, opened in 1918. Picture from 1925. Courtesy: VU, Collection HDC | Protestant Heritage.

for adding new faculties to the university.[20] This way, the medical faculty was allowed to grow in the coming years.

The question remained how the new faculty, with Bouman at its head, would give substance to Christian medicine and whether it would undergo its own laboratory revolution. For Bouman, it was clear that a clinic was not enough, that the execution of research was essential, and that the aim should be a medical faculty with laboratories. Inspired by what Kuyper and others had previously argued, yet with a slight shift in emphasis, he developed his vision of psychiatry and medicine in general over the following years.

Development of the Medical Faculty of the Vrije Universiteit

Leendert Bouman had an outspoken conception of psychiatry.[21] On the basis of his strong Christian convictions, he was clearly opposed to a strictly

20 A.H. Bornebroek, *Als een goed rentmeester. Een schets van de Van Coeverden Adriani Stichting en haar oprichter* (Amsterdam: HDC, 1991), p. 45.

21 On Bouman and his view on psychiatry: Timo Bolt, 'De pendel, de kloof en de kliniek: Leendert Bouman (1869-1936) en de "psychologische wending" in de Nederlandse psychiatrie',

biological, brain-anatomical psychiatry, the approach that had flourished in the mid-nineteenth century and was still influential around 1900. Thus, he refused to reduce the 'soul' to physical-chemical processes in the brain. Although Bouman was not the only one who advocated this approach—he himself gratefully noted that there was a wider movement at the time that paid more attention to the special character of the human *psyche*—for him, as a devout Christian, it was of course especially important.[22] In his inaugural address in 1907, entitled *De wetenschappelijke beoefening der psychiatrie* ('the scientific approach to psychiatry'), he sketched his ideas, which in his view were more 'scientific' than those of the 'materialists', who strove for a 'Psychologie ohne Seele' ('psychology without a soul'). A truly scientific psychiatry acknowledged the existence of 'the soul'. Consequently, psychiatry had to be based primarily on clinical research, according to Bouman, although he also acknowledged the importance of laboratory research for the field, within certain limitations. According to him: 'Anatomy, chemistry, and bacteriology, and also the endogenous factors that are assumed in heredity, can only provide explanations in the domains of anatomy, physiology, or bacteriology, but they are powerless in providing scientific understanding of aberrations in the psychological domain.' And therefore: 'Neuropathological, psychological-chemical, bacteriological, and histopathological investigations are very important for the clinician, but they function only as auxiliary sciences.'[23] In line with this view, and much like his later colleague Frederik Jacobus Johannes Buytendijk, Bouman did not principally object to research on animals and vivisection, although he admitted that there were also some drawbacks to the experiments, as he himself had gradually become more opposed to causing pain to animals.[24]

Nevertheless, as 'auxiliary sciences', the basic sciences and laboratory experiments (on animals) were important for psychiatry, and for medicine

Studium, 3 (2010), 82–99; J.A. van Belzen, *Psychopathologie en religie. Ideeën, behandeling en verzorging in de gereformeerde psychiatrie, 1880-1940* (Kampen: Kok, 1989), pp. 37–47.

22 Cf. Hans de Waardt, *Mending Minds. A Cultural History of Dutch Academic Psychiatry* (Rotterdam: Erasmus Publishing, 2005), pp. 89, 97–103.

23 L. Bouman, *De wetenschappelijke beoefening der psychiatrie. Rede bij de aanvaarding van het hoogleraarsambt aan de Vrije Universiteit te Amsterdam, den 27en september 1907 uitgesproken* (Kampen: Kok, 1907), p. 18: 'Anatomie, chemie en bacteriologie, ook de endogene factoren, die men in de herediteit wil aannemen, kunnen echter alleen verklaringen geven op anatomisch, physiologisch of bacteriologisch gebied, maar zijn machteloos voor het geven van een wetenschappelijk inzicht in de afwijkingen op psychisch gebied. Neuropathologische, psychologisch-chemische, bacteriologische en histopathologische onderzoekingen zijn voor den klinicus van veel gewicht, maar ze fungeeren alleen als hulpwetenschappen.'

24 Kluveld, *Reis door de hel*, p. 184.

in general, but always as part of the broader picture. Thus, Bouman certainly did not underestimate or neglect this kind of research. Within the clinic he had already furnished rooms as 'laboratories': there was an anatomical laboratory, a chemical laboratory, and a biological laboratory. For the latter two laboratories, dr. J.A. van Hasselt and the aforementioned F.J.J. Buytendijk were appointed as his assistants in 1913.[25]

Inside the laboratories Bouman gave his assistants a lot of freedom to do research. Especially when Frits Buytendijk (1887–1974), at the time a 26-year-old promising physician, extended his research in the following years, it quickly became clear that a larger laboratory was needed, as the room in the clinic soon became inadequate.[26] In 1914 Buytendijk was appointed lecturer (*lector*) in biology, and shortly afterwards, he presented specific and detailed plans and calculations for a new 'biological' (or physiological) laboratory to the directors. This proposal was part of a wider plan for the expansion of the medical faculty, which Buytendijk and Bouman presented to the directors, including ideas about laboratories and professorships and the costs these would involve.[27]

In these plans, an expanded medical faculty would initially train students for a bachelor's degree (*kandidaatsexamen*) only. At an earlier stage, there had been plans to first develop a programme for the master's degree (*doctoraal-examen*) and the medical finals. This would have been more expensive, and it would require a hospital, but it would also have appealed more to the imagination of the Calvinist supporters of the university, who, after all, were more interested in (Christian) patient care than in fundamental research. Buytendijk's plans, however, were not cheap either. They required several laboratories: at least a physiological, an anatomical, and a pathological lab. Because the medical study also involved many subjects in the natural sciences, laboratories for physics, chemistry, botany, and zoology would be needed as well in the long run. Buytendijk explained to the directors that the possibilities in the psychiatric clinic (the 'laboratories') were already too limited for current research. There was not enough space, and the rooms

25 VU, Curators' Archives 1913/1914, inv.nr. 22. See also Wieringa, 'Lotgevallen', p. 34.

26 On Buytendijk and his view of science: W.J.M. Dekkers, *Het bezielde lichaam. Het ontwerp van een antropologische fysiologie en geneeskunde volgens F.J.J. Buytendijk* (Zeist: Kerckebosch, 1985); Flipse, *Christelijke wetenschap*, pp. 196–209; Ruud Abma, 'Frederik Buytendijk (1887-1974)', in V. Busato, M. van Essen, and W. Koops, eds., *Van fenomenologie naar empirisch-analytische psychologie. Pioniers van de Nederlandse gedragswetenschappen*, vol. 2 (Amsterdam: Bert Bakker, 2014), pp. 27–101; Sebastiaan Broere, 'Synthesis and Race: Barge, Buytendijk, and the "rassenvraagstuk" of the 1930s', *Studium*, 9 (2017), 185–201 (pp. 188–93).

27 Meeting documents, d.d. 1 April 1915, Amsterdam, VU, Directors' Archives, inv.nr. 22; meeting documents, d.d. 8 November 1915, Amsterdam, VU, Directors' Archives, inv.nr. 58.

were unsuitable for animal experiments. As Buytendijk convincingly argued when he was invited to a meeting with the directors, much more specific equipment was needed in the future.[28]

Design and Equipment of the Physiological Laboratory

Laboratories come in various shapes and sizes, depending on the character of the research pursued. It is therefore interesting to see what kind of laboratory Buytendijk had in mind. At the request of the directors, Buytendijk expounded his plans in some detail in a 22-page notebook with the title 'Explanatory annex to the plans for the construction of a Physiological Laboratory', dated 12 June 1916. To find inspiration for his plans, he had visited other physiological laboratories in the Netherlands (in Utrecht and Groningen) and he had spoken with professors there: Hendrik Zwaardemaker and Hartog Jacob Hamburger.[29] Because of the costs, he was naturally supposed to aim for a laboratory that was as small and cheap as possible, but at the same time it had to be a 'sufficiently big laboratory', suitable for modern, contemporary research and teaching as well as for scientific meetings, summer courses, and other similar purposes.

In the planned laboratory building, there would be a lecture room for about 50 students and several laboratory rooms: a physical laboratory, a chemical laboratory, and an 'animal and psychology laboratory'. In addition, the plans outlined a dark room, an instruments workshop, a room for tissue research, a library, a room for microchemistry, and accommodation for animals. There had been communication with an architect, and a provisional floor plan was added. Because the possibility had arisen of taking a long lease for the piece of land next to the Valerius Clinic, a speedy decision was needed. The directors decided that the laboratory was going to be built, in particular because they were convinced that the research that Buytendijk envisaged was important for the university.[30]

28 Minutes, 30 March 1915, Amsterdam, VU, Directors' Archives.

29 Meeting documents, 1916, Amsterdam, VU, Directors' Archives, inv.nr. 35: 'Memorie van toelichting bij de plannen voor den bouw van een Physiologisch Laboratorium', and minutes directors, 20 June 1916. On Hamburger: Klaas van Berkel, *Universiteit van het Noorden. Vier eeuwen academisch leven in Groningen*, 4 vols. (Hilversum: Verloren, 2014–22), vol. 2*: De klassieke universiteit, 1876-1945*, pp. 259–63. On Zwaardemaker: G. Grijns, 'In memoriam: prof.dr. H. Zwaardemaker Czn', *Nederlandsch Tijdschrift voor Geneeskunde*, 74 (1930), 4752–5.

30 Minutes meetings directors, 18 December 1915, 2 May 1916, 20 June 1916, Amsterdam, VU, Directors' Archives.

On 29 November 1916 the first stone was laid in the presence of the architects Th. Groenendijk and Th.J. Lammers, the VU directors and professors, and the directors of the Van Coeverden Adriani Foundation, the most important financial backer.[31] More than a year later, on 22 January 1918, the Physiological Laboratory was officially inaugurated, on which occasion Buytendijk gave an address on 'instinct and life'. Just as Bouman had done earlier, Buytendijk gratefully noted that 'the science of our time is no longer characterized by materialism'. It was generally recognized 'that life is more than force and matter, more than a collection of physico-chemical processes'. But this insight had thus far hardly resulted in a different type of research. This is precisely where the new laboratory could take initiative.[32]

The same year, Buytendijk obtained his PhD in Utrecht with Zwaardemaker with a dissertation on *Proeven over gewoontevorming bij dieren* ('Experiments into habit formation in animals'), largely based on research he had actually done at the VU.[33] Now the road was also open to an appointment as professor at the VU.

Research Programme and Teaching

The university wanted to provide Christian higher education, but it also wanted to do research as part of developing a 'Christian science' based on Calvinist principles. Buytendijk therefore had to convince the directors that his research was going to be relevant in that context as well. Shortly before his appointment as professor, he produced a 'Sketch of a method for creating a Christian biology'. Here he explained that there are different 'schools' in biology, which often arrive at different results in the domain of natural philosophy and scientific theories, but they also differed in the choice of experiments. 'Materialist', 'psycho-monistic', 'energetic-monistic', and, on the other hand, 'theistic' convictions led to different forms of science at every level. Physiologists with those beliefs, but also someone like Ivan Pavlov with his reflex response research on behaviour, opted for strictly mechanistic explanations, which fitted in a materialist worldview. According to Buytendijk, theists had a wider perspective and looked for different

31 Bornebroek, *Als een goed rentmeester*, p. 57.

32 F.J.J. Buytendijk, 'Instinkt en leven', *Orgaan van de Christelijke Vereeniging van Natuur- en Geneeskundigen in Nederland*, (1918), 1–18 (p. 2): 'Het heet, dat de wetenschap van onzen tijd niet langer in het teeken van het materialisme staat', 'Dat het leven meer is dan kracht en stof, meer dan eene verzameling physico-chemische processen'.

33 F.J.J. Buytendijk, *Proeven over gewoontevorming bij dieren* (PhD diss., Utrecht, 1918).

types of explanations, which involved immaterial factors as well, such as teleological (vitalist or holist) explanations of life or of the psychological domain. His own research, Buytendijk claimed, 'converged towards these [theist, AF] natural-philosophical principles and thus towards Scripture itself'.[34] In this way, Buytendijk managed to convince the directors of the importance of the new laboratory and, incidentally, of his own reliability as well. These points had involved a certain amount of debate. The directors wondered: was his quite technical work sufficiently inspired by Calvinist principles, and was it sufficiently in line with the character of the VU?[35]

On 9 May 1919, on the occasion of his inauguration as a professor at the VU, Buytendijk gave an address entitled *Oude problemen in de modern biologie* ('Old problems in modern biology'). He stated again that 'theist philosophy' had its own approach concerning 'the theory of life'. He discussed extensively what modern biology had to say about 'the old problem of the inner life of animals'. These days, he pointed out, 'the existence of an animal psyche' was once again recognized. This meant that 'the machine explanation of life' had been abandoned. In addition, research seemed to show that there was a fundamental difference between the human and the animal psyche.[36] It was this research into the animal psyche that Buytendijk wanted to replicate and further develop in his own laboratory.

With Buytendijk's appointment, the medical faculty in the making counted two professors. The core of the faculty remained Bouman's psychiatric work in the clinic and, in principle, the work in the laboratory was conducted in the service of the work in the clinic. Buytendijk therefore gave various lectures in physiology that were deemed important for prospective psychiatrists. In the academic years 1916–17 and following, a variety of lectures given by Buytendijk were listed in the *Series Lectionum*, the university roster, including 'General biology' (metabolism, nervous system, vitalism), 'Physiology' (e.g. respiration, energy exchange, heat regulation, eye and ear), 'Animal psychology' (e.g. demonstrations about observation and action, differences in psychological functions between monkeys and children), and 'Philosophy of nature' (e.g. evolution, individuality, essential differences between humans and animals). These lectures were attended

34 Meeting documents, 1919, Amsterdam, VU, Directors' Archives, inv.nr. 2: 'Schets eener methode voor het tot stand brengen eener Christelijke Biologie', quotation on p. II: 'convergeeren naar deze natuurphilosophische principia en dus naar de Schrift zelf'.

35 Bornebroek, *Als een goed rentmeester*, pp. 56–7; Van Bergen, *Van genezen in geloof*, p. 210.

36 F.J.J. Buytendijk, *Oude problemen in de modern biologie. Rede bij de aanvaarding van het hoogleraarsambt aan de Vrije universiteit te Amsterdam, den 9en mei 1919 uitgesproken* (Haarlem: Bohn, 1919), pp. 7, 18–19.

Figure 8.2 F.J.J. Buytendijk in the Physiological Laboratory, standing next to (probably) a micro respirometer, 1919. (Thanks to Mart van Lieburg for his suggestion regarding the apparatus.) Courtesy: VU, Collection HDC | Protestant Heritage.

by 10 to 40 students; some of them were students from other faculties, while others were medical students who combined their studies at the VU with their programme in medicine at the municipal University of Amsterdam.[37]

The choice of research topics was partly determined by the fact that the lab was an offshoot of the psychiatric clinic. The clinic viewed physiology as an auxiliary science and as such important for Christian physicians. For psychiatrists in training, research into animal psychology seemed most relevant. Buytendijk capitalized on this point with his demonstrations during his lectures. Despite these teaching links, the laboratory was quite independent of the clinic. The lab was also formally part of the university, as it was part of the nascent medical faculty. Within the university this faculty occupied a special place, as it was very different from the other faculties, if only because much more money was involved. Most of this money still had to be raised by the Calvinist rank-and-file, although in 1922 Bouman and Buytendijk were the first to get a government research grant.[38] The way the work was organized was also very different from the

37 *Jaarverslag van de Vereeniging voor Hooger Onderwijs op Gereformeerden Grondslag* (1918–24).
38 J. Roelink, *Een blinkend spoor. Beeld van een eeuw geschiedenis der Vereniging voor wetenschappelijk onderwijs op gereformeerde grondslag, 1879-1979* (Kampen: Kok, 1979), pp. 163–4.

humanities faculties. Instead of professors doing their work individually, here there was a complete research group, with assistants and laboratory staff, working under the guidance of a professor. This had implications for the role of Calvinist principles of the university, because only the professor was vetted to see if he subscribed to these principles. A number of young scientists and doctors with a variety of philosophical views gathered around Bouman and Buytendijk during these years, and several of these individuals would later become professors at other universities.[39]

The Research Carried out in the Laboratory

The plans Buytendijk had presented were well received, but what sort of research was actually carried out in the lab? In a lecture given a few years after the opening of the lab, Buytendijk expanded on this point and explained why he had made those particular choices. He stated: 'We have, both in the design and in the equipment of the laboratory, made a definite choice about the direction that our research was going to take.'[40] The research had developed in two directions: metabolism and animal psychology. Both choices were inspired by the Christian character of the VU, Buytendijk claimed, as both had to be seen as so-called *Ganzheitserscheinungen* ('holistic phenomena'), and the research was partly influenced by this starting point.

Nevertheless, the actual research on metabolism appears to have been barely influenced by religious considerations. It is true that the physiological research that Buytendijk carried out was unique, as it was not yet conducted at other universities in the Netherlands, but the choice had been made mainly for pragmatic reasons; it was a niche, which was also relatively cheap. The research focused, among other things, on the influence of sports, in particular rowing, on metabolism in humans. For this, a respiration calorimeter was built, modelled on that of the American chemist W.O. Atwater and with several improvements. It was the first respiration calorimeter of its kind in Europe. Many other kinds of physiological measurements were also taken in animals and humans, including measurements on the heart

39 H.E.S. Woldring, *Een handvol filosofen. Geschiedenis van de filosofiebeoefening aan de Vrije Universiteit in Amsterdam van 1880 tot 2012* (Hilversum: Verloren, 2013), p. 87; De Waardt, *Mending Minds*, pp. 99–101; Van Deursen, *Distinctive Character*, p. 110.

40 F.J.J. Buytendijk, 'Iets over den arbeid in het physiologisch laboratorium der Vrije Universiteit', *Orgaan van de Christelijke Vereeniging van Natuur- en Geneeskundigen in Nederland* (1922), 7–13 (p. 7): 'Wij hebben dan ook èn bij den bouw èn bij de inrichting van dit laboratorium een zeer besliste keuze gedaan in de richting waarin onze onderzoekingen zich zouden bezighouden.'

and lungs. Despite its hands-on character, this kind of research, according to Buytendijk, nevertheless touched upon fundamental questions, because metabolism involved 'coherence and cooperation of everything present in the organism' as it aimed at a purpose. In addition, this research could also lead to 'recognition of God's greatness in the works of his hands'.[41]

The research into animal psychology was more distinctive; it mainly focused on 'habit formation' (*gewoontevorming*), the term Buytendijk used to denote the learning abilities of animals.[42] In the late nineteenth century, a great deal of comparative psychological research was done in this area, particularly in America. It was a field of research derived from the work of Charles Darwin and George Romanes, as evolutionary theory made it interesting to investigate 'animal intelligence'. Buytendijk wanted to do similar research but starting from different principles, and he had already referred to Robert Yerkes's (1876–1956) laboratory for animal psychology at Harvard in his proposals to the directors of the VU.[43] What Buytendijk had in mind was training animals in multiple-choice arrangements, or in mazes and puzzle boxes. Buytendijk was the first to introduce this type of research in the Netherlands.[44]

Buytendijk did research with a wide variety of animals: water fleas, snails, dogs, monkeys, birds, fishes, amphibians. Some of the research concerned the senses, such as smell and scent, sight, and hearing. But much of the research was genuine animal psychology. He investigated whether birds could learn behind which hatch there was food and for how long they could remember this. Or how quickly a snail emerged from a test tube. And whether monkeys could make links between colours and shapes and whether they could discover patterns in the locations where they could find food.[45]

41 Buytendijk, 'Iets over den arbeid', pp. 7–11 (p. 7): 'samenhang en samenwerking van alles wat in het organisme aanwezig is'; quotation on p. 11: 'erkenning van Gods grootheid in de werken van zijn handen.'

42 Buytendijk, 'Iets over den arbeid', pp. 8–9; Buytendijk, 'Instinct en leven', pp. 20–2; D.R. Röell, 'F.J.J. Buytendijks (1887-1974) ontwerp van een christelijke diepsychologie', *Gewina*, 15 (1992), 34–50.

43 Cf. *Zevenendertigste Jaarverslag van de Vereeniging voor Hooger Onderwijs op Gereformeerden Grondslag* (Amsterdam: 1917), p. XXVII; Buytendijk, 'Instinct en leven', p. 11. On Yerkes: Boakes, *From Darwin to Behaviourism*, pp. 148–58.

44 D.R. Roëll, *The World of Instinct: Niko Tinbergen and the Rise of Ethology in the Netherlands (1920-1950)* (Assen: Van Gorcum, 2000), pp. 147–52.

45 For a list of Buytendijk's publications and a detailed description of the research, see: J.A. Bierens de Haan, 'Sieben Jahre tierpsychologische Arbeit in Amsterdam', *Zeitschrift für angewandte Psychologie*, 27 (1926), 236–67. Thanks to W.J. van der Schoor for letting me use his MSc thesis: *Bezield gedrag. Theorie en experimentele praktijk in de dierpsychologie van F.J.J. Buytendijk (1887-1974)* (Unpublished thesis, Leiden, 1984).

In his book *Psychologie der dieren* ('The psychology of animals'), published in 1920 and partly based on his own research, Buytendijk explained that the psyche directs life. In sensory perception and behaviour, some psychological element must be active. Mechanist theories are therefore incorrect: behaviour cannot be explained purely mechanically. The second point that he emphasized was that the greatest achievements of animals, however surprising, are still incomparable to those of human beings. In addition, it was not the case that animals that are supposedly—evolutionarily—closer to humans are always better able to learn. In this context he criticized Yerkes's interpretation of certain experiments with orang-utans.[46]

According to Buytendijk, his research produced two main results. On the one hand, the results challenged the mechanist explanations of life, and on the other hand, the experiments demonstrated the special status of humans.[47] The religious and philosophical convictions that inspired Buytendijk where in harmony with his research. They had influenced the choice of experiments but to a certain extent also their interpretation.

Although Buytendijk's experiments were similar to those of Yerkes and other early animal psychologists, there were also important differences, not only regarding the (religious) interpretation but also regarding methodology. Buytendijk often refrained from analysing his results quantitatively with the use of statistics and learning curves, as was done in Harvard and other laboratories in the US. His claims were mainly based on qualitative descriptions of behaviour. In the end Buytendijk's approach to animal behaviour was what might be called a 'Verstehen' of the phenomena. Buytendijk was convinced that in the life sciences, in addition to the method of 'Erklären', a 'verstehende' approach was needed in order to read 'the book of nature'. 'Verstehen' was for Buytendijk a synthetic approach in which the totality was disturbed as little as possible. The analytical method failed because nature was, according to Buytendijk, 'a book with many letters and not with a number of ink blotches'.[48]

In 1924 Buytendijk moved to Groningen, where he was appointed professor of general physiology as the successor of Hamburger. In Groningen he initially

46 F.J.J. Buytendijk, *Psychologie der dieren* (Haarlem: Bohn, 1920), passim, esp. pp. 195–222.

47 See also: F.J.J. Buytendijk, *Bijdrage tot een onderzoek naar het wezensverschil van mensch en dier. Referaat gehouden op de Wetenschappelijke samenkomst* [*van de Vrije Universiteit*] *op 12 Juli 1922* (Amsterdam: Kirchner, 1922).

48 F.J.J. Buytendijk, *Over het verstaan der levensverschijnselen. Rede uitgesproken bij de aanvaarding van het ambt van hoogleeraar in de physiologie aan de Rijksuniversiteit Groningen op 17 januari 1925* (Groningen: Wolters, 1925), p. 11: 'een boek met vele letters en niet met een hoeveelheid inktvlekken'. See also: Röell, 'Buytendijks ontwerp', p. 44; Dekkers, *Het bezielde lichaam*, p. 66.

continued his research on animal psychology; he later focused on human psychology. He also developed in the realm of religion, and he would later convert to Catholicism. There were various reasons for his departure from the VU. Buytendijk gradually felt less at home with Calvinism, especially because the Calvinist theologians in the 1920s took a more fundamentalist stance than before.[49] Moreover, there was the fact that there seemed to be little prospect of further growth for the medical faculty at the VU. After Buytendijk's departure the Physiological Laboratory was used for a variety of other functions for several decades. Physiological research took place only on a very small scale. The Valerius Clinic continued to function, although Bouman departed as well, but to Utrecht. (Bouman continued to give some lectures at the VU as an extraordinary professor.)[50] Buytendijk's work in animal psychology incidentally had some followers outside the VU. J.A. Bierens de Haan, who had worked in Buytendijk's lab, adopted his approach, and he continued his research in his own laboratory in the Artis Zoo in Amsterdam for some time.[51]

In the 1930s 'ethology' emerged as an independent discipline that had its own approach to animal behaviour. The most important representatives of this new discipline were Niko Tinbergen and Konrad Lorenz.[52] Remarkably, 'ethology' and 'animal psychology' did not merge, but 'animal psychology' also did not survive on its own. In his study *The World of Instinct*, on the origin of ethology in the Netherlands, René Röell suggests several explanations for this course of events. Many who were critical of the work of the pioneers of 'animal psychology' in the Netherlands took issue with the anti-mechanistic (vitalistic or holistic) and teleological framework in which study of the animal soul was placed by the field's most important representatives.[53] In the case of Buytendijk, this was even an explicitly Christian framework, even though one could say that did not seem to have influenced the practice of the experiments very much. Nevertheless, it may have put off other physiologists and biologists.

49 Flipse, *Christelijke wetenschap*, p. 216. See also: Stuart Mathieson and Abraham C. Flipse, 'Religious Controversy in Comparative Context: Ulster, the Netherlands and South Africa in the 1920s', *History*, 106 (2021), 429–55.

50 Peter Hellema, *Spreek en houd het niet voor je. De loopbaan in de psychiatrie van Lammert van der Horst (1893-1978)* (Amsterdam: Vesuvius, [2019]), pp. 78–9; Wieringa, 'Lotgevallen van de Valeriuskliniek', pp. 52–60; Connie Pieksma, *Het fysiologisch laboratorium VU/VUmc. Feiten en gebeurtenissen* (Amsterdam: VU, 2007).

51 Röell, *The World of Instinct*, pp. 152–3.

52 Richard W. Burckhard Jr., *Patterns of Behavior: Konrad Lorenz, Niko Tinbergen, and the Founding of Ethology* (Chicago: University of Chicago Press, 2005), pp. 34–86; Röell, *The World of Instinct*, pp. 34–86.

53 Röell, *The World of Instinct*, pp. 172–3.

When the VU expanded again in 1930, it chose to establish a science faculty. A condition in the Law of Higher Education of the Netherlands of 1905 turned out to be the deciding factor for action. This law had recognized the validity of the VU degrees (the so-called *effectus civilis*). One important condition was that the VU had to expand gradually to a 'complete' university, with five faculties: a fourth faculty was to be established not later than 1930, and a fifth not later than 1955 (both comprising at least three chairs).[54] Therefore, by 1930, not founding a fourth faculty was no longer a serious option. Now that the medical faculty had almost disappeared, the directors opted for starting a science faculty as the fourth faculty. This was not easy either, but it seemed slightly more realistic than a complete medical faculty with all the different specializations. For the science faculty, new laboratory buildings were erected for chemistry and physics, next to the Physiological Laboratory. Professors of mathematics, physics, and chemistry were appointed, and the first students arrived in 1930.[55]

Conclusion: The Distinctive Character of the Laboratory and its Lasting Heritage

Although a laboratory and working in one were novel phenomena within the Vrije Universiteit in 1918, it seems that the introduction of the lab, notwithstanding earlier hesitation and decades of debate, proceeded relatively smoothly. It was of course a big step which required a lot of money. Moreover, a discipline like theology, but also a hospital or a clinic, appealed more to the imagination of the Calvinist constituency of the university than physiological research in a laboratory. Above all, in the discussions at the time, a certain suspicion is evident against this new form of experimental science, which was associated with 'materialism'. On the other hand, it was ultimately realized that a physiological laboratory was part and parcel of a modern medical faculty. However, the neo-Calvinists also believed that it was possible to create a radically different research strategy grounded in Calvinist principles in their own laboratory. This confidence was reinforced by the

54 A.C. Flipse, 'Against the Science-Religion Conflict. The Genesis of a Calvinist Science Faculty in the Netherlands', *Annals of Science*, 65 (2008), 363–91 (pp. 371–2). The law was passed by Parliament during the period of a coalition cabinet of which Kuyper himself was Prime Minister.
55 Ab Flipse, *'Hier leert de natuur ons zelf den weg'. Een geschiedenis van Natuurkunde en Sterrenkunde aan de VU* (Zoetermeer: Meinema, 2005), pp. 48-74.

fact that the intended research in animal psychology seemed especially relevant and could be used to take a distinctive course.

It turned out that the foundation of this first laboratory was in a sense revolutionary, and it instigated the Vrije Universiteit's own 'laboratory revolution'. For the first time, the university encountered an academic discipline in the sciences. Although the chosen field of animal psychology was precisely an area in which a distinctive emphasis could be imposed, this step was crucial because it demonstrated that the university was increasingly adapting to what was already customary elsewhere. Therefore, even though the physiological lab was used only briefly, it paved the way for the future science faculty, in 1930, and for the further growth into a university that comprised all faculties, later in the century.

About the Author

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