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Photo on the front cover: Sculpture: *Diagonal in Room* by Ingela Palmerts.
The sculpture is situated in an exhibition at Pilarne, a heritage and a beautiful cultural landscape on Tjörn at the west coast of Sweden. Photo: Magnus Rönn

THE EPISTEMOLOGY OF CAMPUS DESIGN: RHIZOMATIC AND PARASITIC OR ISOLATED FABRICS?

THOMAS DAHL

Abstract

In this article, I explore the material organization of universities, commonly called a *campus* as an overreaching term. The main research question is whether and how this organization – with its buildings and spaces – plays a role in supporting the purpose of a university: to contribute to learning, development and research.

Traditionally, university campuses and buildings are analysed through the concepts of space, architectural form and/or style. This analysis approach, I argue, has its limitations, as it is not able to explain the role of the material organization in what is happening at the university, most notably for the learning processes taking place there. In this article, I use the ontological position of actor-network theory, which blurs the distinction between human and non-human actors, and gives materials an acting role. I regard both buildings and campuses as performative actors that interact with other actors, most notably students and educators.

Through a brief study of the history of the university, I show the differences between pre-modern and modern material organization and planning, which was influenced by Wilhelm von Humboldt's idea of a university's purpose. Through a study of the plans for a new campus for the Norwegian University of Science and Technology (NTNU), I question the Humboldtian epistemology and ask whether it is in line with modern learning theories.

1   Introduction

Universities most commonly trace their history back to the university in Bologna and the university in Paris. These two universities arose in response to different events (Ferruolo, 1988; Grendler, 1999), and the towns in which they developed were notably different. Still, these early universities shared some similarities in the material organization of their activities. University buildings, often today grouped in a cluster of buildings called a *campus*, have some marks of the period they originated in: the universities established in the late medieval period were typically found in different buildings located at various points across the towns in which they were located. Most of the early universities arose in mid-sized towns – in Bologna, Padova, and Modena, and not Milan or Rome, in Italy; in Oxford and Cambridge, and not London, in England; and in Lund and Uppsala, and not Stockholm, in Sweden. Paris is an exception, but here also the university buildings were found scattered around certain areas, like the Latin Quarter.

Later universities show a different structure in building(s). Many of the universities built after World War II appear as large monolithic structures, often built outside or on the edge of towns. This was especially typical in West Germany, where more than 20 new universities were established in the decades after the second world war (Hnilica, 2014, p. 211), which were built over a short period of time and arose as large mushrooms outside the university towns. As separate building complexes outside of town, they represent a notable shift in how the campuses of universities were organized.

The town Trondheim in Norway also witnessed such changes in university planning. Although Trondheim had institutions for higher education located at different sites in the town, it was decided in the 1960s to build a new "university centre" outside of town that would house the university and integrate the old institutions. In the late 1970s, a totally new building complex was inaugurated, designed by the Copenhagen-based architectural office *Henning Larsens Tegnestue*. The complex was large – one of the largest in Norway – and would have become even larger, if the whole plan had been achieved; the University Centre at Dragvoll would have become the largest building complex in Norway (Brandt & Nordal, 2010, p. 335).

But what was to become the largest campus in Norway (and was the inspiration for other buildings in Trondheim) is now to be sold. The university has decided to move from Campus Dragvoll into a new central campus for the University of Trondheim: Campus Gløshaugen. What was the reason for this decision, and why would a university not settle with the well-designed plan of *Henning Larsens Tegnestue?* One possible explanation is that the new university plan in Trondheim may represent

a new way of thinking about the material organization of universities. It remains to be seen whether this new plan will contribute to what the university is supposed to do.

The case of Trondheim can be used to answer a much larger question: Does the way universities arrange and design their buildings contribute to the purpose of the university? In other words, are buildings and their arrangements active agents in higher education?

2   Buildings as actors

University buildings are commonly seen as places for research and learning. In their book on university planning and architecture, Coulson, Roberts and Taylor state that "The buildings and landscapes that make up a university's physical estate … provide the arena that enables learning and research activities to take place" (Coulson, Roberts, & Taylor, 2015a, p. 121). According to them, the buildings and landscape also shape the way we interact: "From a psychological perspective, they create the backdrop for the social interaction and collective and individual memories, which are fundamental to the university experience" (Ibid.).

There is a tendency to analyse the role of university buildings and campuses in spatial terms. Richard Dober uses the term "placemaking" in his book *Campus Design* (Dober, 1992) to describe the foundation in making a campus: "Placemaking is an essential first step in creating rational and pleasurable campus design" (Dober, 1992, p. 229).

Paul Temple defines universities as "learning spaces" (Temple, 2008, p. 229). Space and place might "affect in a number of ways the teaching and learning, the research and the other interconnected activities that go on within institutions" (Temple, 2009, p. 210). Obviously, no simple causality exists in the way spaces and places operate, as Temple explicitly states. Universities are a vivid example of this; universities that still have their medieval structure and old buildings continue to produce world-class research today. If one were to give space a role, one can better approach it in the way Manuel Delanda does, as "multiplicities" and as "spaces of possibilities" (Delanda, 2002, p. 10).

However, is campus design only a question of space and place? Obviously not; even Dober uses time to explore the styles and architectural designs of university buildings. Still, the way these buildings contribute to or are part of what's happening at the university is not studied. I think the role of spaces and buildings can be better analysed if we think of them not only as organizational entities of the university activities or as having specific styles and designs; instead, we should think of them as actors interacting with the activities on campus. University buildings are not only non-living material that shape our spaces and learning landscapes,

as little as buildings in general are non-living material. In line with what has become called "the performative turn" in social sciences (Dahl, 2019; Østern & Dahl, 2019), one should view buildings as active actors with performative powers, who are able to interact in our activities.

Actor-network theory is the theory that perhaps most explicitly makes the shift from regarding materiality as a passive asset to regarding it as an active one. Bruno Latour, in his iconoclastic way, attacks the social sciences for its ignorance of the way materiality interacts in our life. "Action is not a property of humans but of an association of actants" (Latour, 1999, p. 182). With the term "actant", Latour breaks the old dichotomy of human vs. non-human. The distinction may be needed if we discuss intentionality; however, for what happens in the world, intentionality plays a minor role. The most important point is what happens and how the actants contribute to what is happening: "always shift from actors to actants, from competences to performances" (Latour, 2013, p. 11).

Actants operate in networks with other actants. Buildings, roads, university parks, libraries, professors, students, administrative personnel and the inhabitants of the town all generate the way in which the university acts. Bruno Latour has especially focused on the networks of actants within the sciences; he has also studied urban systems, like the metro system in Paris (Latour, 1988; 1992). Actor-network theory has been shown to have potential in architectural research (Fallan, 2008), and with post-humanities evolving (Braidotti, 2013), what was seen as a far-fetched approach has become a common way of seeing materiality. However, the epistemology of the actor-network theory does have a potential that is not fully utilized. It is not only a question of materiality being performative and an actant: the way networks operate is also likely to produce some sort of knowledge. Latour has shown this to be the case within the sciences, and I think it is also the case with universities: they are networks of actants that produce knowledge.

Such networks are not fixed and stable. The roles of material and non-material agents shift over time. We may regard them as "rhizomatic", in line with Gilles Deleuze and Felix Guattari. A rhizomatic structure is the opposite of a hierarchical, stable structure. Rhizomes are multiplicities; they are essential heterogeneous. The connections between the different parts are diverse, the communication between the actors varies and may include different dialects (Deleuze & Guattari, 1980, p. 13-14). Rhizomatic structures are productive, in that they produce newness. They are the "multiplicities" of Delanda that generate possibilities. They set in play the "états de choses", the order of things (Deleuze & Guattari, 1980, p. 13).

Rhizomatic networks are interrelated; in fact, one could even say that they are intra-related, as what the actors in the network 'are' is a result of

their 'becoming'. They emerge in "their entangled intra-relation" (Barad, 2007, p. ix). The actors (*actants*) in the network are "only distinct in relation to their mutual entanglement"(Barad, 2007, p. 33). What a university *is,* is what it becomes through the intra-action among all the actors in the university—the student, the buildings, the teachers, the parks, the roads, the glass façade of the main building, the passages between the laboratories, the lecture hall and so on.

In his reading of Spinoza, Deleuze explores an important way these intra-relations operate: they affect each other. Spinoza challenges Descartes' purely cognitive vision of man – *cogito ergo sum* – by letting the body play the main role. Without the body, there is no idea, no cognition. The main way the body produces ideas and thereby cognition is through being sensitive, through being affected. By being affected (*affectio*), the body produces affects (*affectus*). The affect (*affectus*) comes in between the bodily response to something and the idea or vision produced in the body (Deleuze, 1988, p. 49).

Deleuze's reading of Spinoza and the role of affects are paralleled with neurobiological research. Antonio Damasio's ground-breaking book, *Descartes' Error* (Damasio, 1994), makes emotions a central issue in neurology, thereby contributing to the "emotional turn" that is taking place in the social sciences and humanities (Lemmings & Brooks, 2014). Cognition cannot be regarded as something separate from emotions or the body, as Michel Serres strongly argues:

> *The origin of knowledge resides in the body, not only intersubjective but also objective knowledge. We don't know anyone or anything until the body takes on its form, its appearance, its movement, its habitus, until the body joins in a dance with its demeanour* (Serres, 2011, p. 70-71).

This view on how knowledge is produced and how we learn is vividly described by German neurobiologist Gerhard Roth's definition of learning: learning is an "emotional and cognitive dance" (Roth, 2011, p. 312). With an actor-network perspective, humans are not the only ones that participate in this dance; all sorts of agents can take part. Materiality produces affects, and thus may contribute to learning.

In planning theory today, there is hardly any question about how material agents stimulate emotions. An example is in the building and planning of kindergartens. Kindergartens today are often specifically designed to stimulate both mental and physical activities of children with their use of colours, spaces and design. In kindergartens, we can see "architecture, space and materiality as players and counter-players in pedagogy" (Nordtømme, 2015, p. 4). The material manifestation of kindergarten spaces could be defined as a third teacher, one that does not directly tell

students what to do, but nevertheless interacts in the learning process-es as an active agent. The kindergarten buildings, design, plans, rooms, colours, etc. produce affects in children. This sort of understanding is not present in the planning of higher education, perhaps because we still think in Piagetian terms about learning, which argue that by higher education, students have developed their pure cognitive capacities. As a result, we believe that their learning is purely cognitive. Neurobiology has proven that this belief is wrong – emotions are also present for stu-dents in higher education, and even for teachers.

3   The faculties, not the universities

Starting the history of universities with the establishment of the Univer-sity of Bologna in 1088 is wrong for two reasons. First, institutions for higher education that could be called universities existed before Bolog-na and outside Europe. In Bagdad, the House of Wisdom flourished from the ninth to the mid-thirteenth century, producing world-class academ-ics like Ibn Sina (Avicenna), probably the most influential medical doctor in history (Porter, 1997, p. 98-99). The medical school in Salerno, *Schola Medica Salernitana*, has a history dating back to the 9th century. Even in Bologna, higher education existed before the founding of the university.

The second reason that beginning the history of universities in 1088 is inaccurate is that it is ahistorical. The term "university" had a different meaning when Bologna established its university in 1088. Teaching, espe-cially in law, was conducted at various locations in the town, mostly by individual masters with their own "chair" (Beckwith, 2012, p. 43). Higher education in Bologna took place in different *scholae* in town. In order to gain power and position, to build "networks of powers" (Hughes, 1983), efforts were made to unify these separate *scholae*; thus, the university was a *universitas scholarium*, a community (*universitas*) for all the dif-ferent schools in a town. The university was a sort of guild for an aca-demic profession, not unlike the other professional guilds in the medi-eval world (Beckwith, 2012, p. 43-46). In Bologna, the students were the primary actors behind this "guilding"; in Paris, the second "university" in Europe, it was the masters (Koch, 2008, p. 26-51).

Before the guildings, no separate buildings were established as the university, in neither Bologna nor Paris. Commonly, locals were hired to teach. The masters did own special teaching localities, and teach-ing took place where one could find suitable rooms and buildings. This phenomenon can also be observed centuries later, in universities that became wealthy and/or landowners. Ludwig Wittgenstein's teaching at Cambridge often took place in his own room in Trinity College (Malcolm, 1958, p. 25).

As the *universitas* was a way to organize and gain power for the different *scholae*, it became possible for universities to have their own buildings. These buildings were not university buildings, but college or faculty buildings, as the different faculties were what made the university. Design efforts were put forth for these buildings, based on a "desire for the prestige that accompanied owning purpose-built academic facilities" (Coulson, Roberts, & Taylor, 2015b, p. 2).

The characteristics of the premodern university are thus organic, in the sense that the university was primarily an organization of various teaching activities. It is difficult to find the locations of these universities: they are scattered around the towns in which they are located. Even in Paris, the one university in a big and central town, the university was scattered around the Latin Quarter. "The university needed the city", and "university and city were symbiotically united from the beginning" (Brockliss, 2000, p. 153, 154). Buildings that marked the university were not needed: faculty buildings were more important than any main building. It is often difficult to find the main building of a university with medieval origins. The predominant building in Oxford is the library – the Bod – and not any of the colleges (Craster, 1952).

It is not difficult to define these pre-modern universities as "rhizomatic": they were not based on a general plan for what a university should be, nor was it arranged with some sort of centre or head, except as an organizational principle. The core of the university was the faculties, and they were primarily directed toward the training of professions: physicians, lawyers, and priests, and later philosophy for the humanities (Kant, 1991 [1798]). The core of the university was the different *scholae*, which in different ways generated some level of interrelations to create a university. The structure can be seen as working well even in modern times, as these medieval universities are still operating and retain much of the same physical outline as in pre-modern times. Bologna, Padova, Lund, Oxford, Cambridge, and even Sorbonne (which is now the part of the University of Paris, and frames most of the medieval university in Paris) do not seem to be hindered by this structure.

4   The modern university

The concept of the modern university arose in the aftermath of the French Revolution. After the revolution, the national convention decided to close down not only the churches but also all the universities. The convention wanted a system of higher education that could fulfil the ideals of the Enlightenment, and to this end it established new institutions. In year III (according to the revolutionary calendar), the convention founded *École Normale Superieure* (ENS), an institution for training teachers, and *École Polytechnique,* an institution for training engineers (Aulard, 1911; Dahl, 2004). These two institutions still exist, and they were located in specific sites – not in the centre of the Latin Quarter, but on the out-

skirts. ENS is still located in Rue d'Ulm, while *École Polytechnique* moved to a campus outside the centre of Paris. The old location in Rue Descartes now houses the Ministry of Higher Education, Research and Innovation.

The revolutionary idea of educating teachers and engineers under Enlightenment ideals did not find resonance in all of Europe. However, technical colleges – or *Hochschulen* as they were called in German – arose across Europe in the 19th century. These colleges for engineers can easily be classified under today's idea of a campus, since they arose as building structures located at specific sites. While the old universities mainly continued with their faculties or colleges scattered around the towns where they were located, the technical universities (as they now often are called) are found at specific sites. These sites have often a main building, and they were often designed by well-known architects. The *Eidgenössische Technische Hochschule* in Zürich, Switzerland, inaugurated in 1855, is one of the most prestigious technical universities today, and its main building was designed by Gottfried Semper. The main building is also in a prestigious location – on a hill overlooking the town. This model is also found in provincial Norway: the main building of the Norwegian *technische hochschule* is also on a hill, and designed by the Norway-famous architect of the day, Bredo Greve. These *hochschulen* showed their significance (to use Dober's terminology) both as space makers and as space markers.

Although the universities in France were closed down after the revolution, and replaced with higher-educational institutions for specific professions, revolutionary France was also in need of the old professions. Although the universities were closed down, the faculties could continue training lawyers and physicians, although not priests. With Napoleon, the term "university" was used again, but not as a term for specific institutions. In 1808, *l'Université impériale* was inaugurated – not only as a new university, but as a regulator of all higher education in France (Boudon, 2007).

The Napoleonic regulation represented a significant change in the role of the university, as higher education was now regulated by the state according to its needs (Aulard, 1911). However, this change did not result in any specific material manifestation. *L'Université impériale* was a regulator, not a site; it was the legislation and the terminology that generated the significance of this university, not its administration or the location of the administration that would fulfil the demands of the law. The university did not have its own main building; hence, the rhizomatic structure of the university prevailed under this legislation. Unity was an idealized concept.

However, this idealized concept was to become more manifest. It is not completely wrong to define Wilhelm von Humboldt as the founder of

the modern university, with his efforts and success in establishing a new university in Berlin, the capital of Prussia.

Berlin already had institutions for higher education before Humboldt. In a sense, Berlin was like Bologna, with institutions scattered around town. However, when the university in Bologna was established, it was as an effort to strengthen these institutions. In contrast, Humboldt, saw a division of higher education into separate schools and faculties as "*verderblich*" (perishable), as "the division in faculties is not scientific education" (Humboldt, 1903 [1810], p. 141). The Humboldtian university would be a scientific university, and scientific education was a higher goal than training professionals within faculties. In Humboldt's view, the university should reach for a higher goal.

The university was no longer a gathering of different *scholae* or a regulation: it became a state institution with the purpose of *Bildung* – the education and development of the individual in accordance with the needs of society. Humboldt wrote: "The university should be in close relation to the practical life and the needs of the state" (Humboldt, 1903 [1810], p. 258), and it should also support the "spiritual life" (Ibid., p. 252). It should give the "*Bildung* of a whole nation" (Ibid., p. 17). In order to serve this purpose, the university had to serve the "pure idea of science", and thus operate in *Einsamkeit und Freiheit*, isolation and freedom (Humboldt, 1903 [1810], p. 251). The university had to move away from the rhizomatic structure of different institutions and buildings.

The Humboldtian university fulfilled Kant's wishes about the fight between the faculties. Kant argued for turning the traditional order upside down, wherein the "lowest" faculty, philosophy, should be the highest, as it was the faculty that dealt with Enlightenment ideals and contributed to *Bildung* (Kant, 1991 [1798]). In addition to schools for training teachers and engineers, the university now became the site for general higher education.

According to Helmut Schelsky, Humboldt's thoughts about the university required an isolation from life in the town. The university needed to be remote from "the misery of bourgeois city life" (Schelsky, 1963, p. 102). Therefore, in Humboldt's plans for where to build the new university, it had to be built on a new site and not in the middle of the town (Schelsky, 1963, p. 68). However, the new university also had to work as a symbol for the national state of Prussia. Consequently, the new university was located in the most prestigious area of town: Unter der Linden. A palace built for Prince Heinrich in the mid-18th century became the main building of the university, and has remained so ever since.

The university in Berlin was a success according to the ideal of unification. Still, as Deleuze and Guattari point out, such a unification cannot

overrule the rhizomatic nature of reality. It may create a peak, or a mushroom, but it cannot totally suppress what has produced it (Deleuze & Guattari, 1980, p. 15). Michel Serres states that the pureness of a unity is as much dependent on the parasites that live on it (Serres, 1980). In other words, the university in Berlin needed the existing institutions and buildings in order to become a university.

The Humboldtian idea of the university was not a collection, a *universitas*, but a unity, a universe. The faculties were to be subordinated to a unity. Deleuze and Guattari describe a unity as able "to appear only when a certain significant takes the power in a multitude" (Deleuze & Guattari, 1980, p. 15). The significant was the idea of a university as one, and it was signified with a building for the university.

Humboldt did not succeed in making the university "a" university in terms of its physical structure, but he laid the groundwork for how universities would be designed in the future. In physical terms, this idea had already been realized with the *polytechniques* and *grandes ecoles*; the universities were required to the same.

One of the best examples of this effort is found in Oslo. Christiania – as Oslo was called in the early 19th century – did not have a university. Unlike Berlin, it didn't have any old institutions for higher education. Thus, making the university was in parallel with building its body. In line with Humboldt's idea of a university, the university could be located at one site. The university in Berlin had its main building on the main street; in Christiania, one could build the whole university on the main street of town. Additionally, the architect was from Berlin (Karl Friedrich Schinkel is regarded as the main architect of the university) (Aslaksby, 2011).

5   The campus

The modern university idea is Humboldtian: the university is a place for higher education that is above the mere training of professionals. It is a place for science as a specific type of modern knowledge production, to be produced in *Einsamkeit und Freiheit*, or isolation and freedom (Humboldt, 1903 [1810], p. 251). More than being a *universitas* for different professions, the university is a place for knowledge production. The university should serve the state, but – unlike technical colleges and teacher training institutions – through free knowledge production for its own purpose of supporting *Bildung*. Ideally, this purpose is achieved by providing the university with its own site. In small provincial countries lacking institutions for higher education (like Norway), such a goal could be achieved, but in central Europe it was difficult, as the universities had to include the old faculties.

However, this was possible in the New World; there, universities arose that were located at a specific location – as did the term "campus". The term can be traced to the College of New Jersey, which was originally founded the mid-18th century as a professional school for training ministers. Like other colleges in the colonies, the buildings were places in "the wilderness" outside of towns (Turner, 1984, p. 23). Between the main building of the college and the town was a large green field, which was commonly called a "yard" or simply "ground". However – probably due to students' use of their learned Latin outside the lecture hall – it was named "campus" in the late 18th century; the Latin word *campus* is simply "green field" (Turner, 1984, p. 47). The term was soon used to describe the fields of other universities, before eventually becoming the term to refer to the whole college or university complex with its buildings.

In many ways, the American university became the realization of the Humboldtian ideal. They became research universities that worked in isolation and freedom. They became knowledge producers in mode 1 of knowledge production, as Gibbons et al. defined it (Gibbons et al., 1994), where the faculties are not the core of the universities, but rather the disciplinary departments or institutes. Knowledge produced primarily addresses academic research questions, with a division between fundamental and applied science. Universities became the centres for knowledge diffusion, and the academic departments became the ideal community (Schryer, 2016, p. 162).

The American universities also generated a new way of academic life. Scientists became employers and were no longer part of a guild of masters or professors, a difference neatly described by Max Weber in his lecture "*Wissenshaft als Beruf*" ("Science as a Vocation") (Weber, 1922). According to Weber, in its isolation science had become a world of artificial abstractions that "with its dry hands try to get to the blood and juice of the real life, but without succeeding" (Weber, 1922, p. 537).

The American universities became – and remain – worlds of their own. The campus was and is like a small town, providing all the necessities for living. The American universities fit well with a functionalistic perspective of society: universities have a specific task to do, and they do their task best as functional units (Schryer, 2016). Talcott Parsons' functionalist sociology, in which the sciences would be ordered according to their "functional specificity" (Parsons, 1939), goes hand-in-hand with the building of American universities.

Such a functional organization can never be pure; moreover, the American universities need their parasites (Serres, 1980). The planning was however based on the idea that the campuses could be towns on their own. Still, even if you can live most of your life as a student (or teacher) on campus at many colleges and universities in the US, you still cannot

be fully separated and isolated from the rest of the world. As Anthony Jack shows in an eminent study of college life, people may be starving at US universities (Jack, 2019).

The functionalism of American universities did reach Europe as a mode of setup for the new post-World War II universities, and in Europe we find the closest achievement of the functionalistic ideal. Not only were these new universities in Europe built as separate building complexes, the building techniques were also functionalistic.

New universities were generated *en masse* across Europe after World War II, with the common feature being a massive building complex outside or at the edge of towns that would become university towns. However, in contrast to the American universities – which had evolved over time, with different architectural styles and with some pastoral flair – the European universities were large complexes, made from scratch, and often with a single architectural office responsible for the whole design. A new university was not built over hundreds of years: it mushroomed in only a short period of time. Sonja Hnilica, in an article on post-war university building in Germany, says that "the new universities are similar. They were all established as large structures and as an island out in a green field" (Hnilica, 2014, p. 212).

The university in Bielefeld is a prominent example of this functionalism. Bielefeld University is not only a huge building complex outside town, it is almost like its own town, with a main street and side streets between the ten stock buldings, all with the same facade and inner organization. Like many universities in the same period, the whole university was built with prefabricated concrete elements, a result of a functionalism in building construction. The architect team that won the competition to design the university in Bielefeld named it as, what is now called, Campus *Lernfabrik* (Hnilica, 2014, p. 211).

However, one big difference remains between the American campuses and the post-war universities in Europe: the American campuses were own worlds. Students and teachers didn't need to live off-campus, because they could get most of what they needed by living there, albeit not at all times or everyone (Jack, 2019). The European universities were not campuses in this sense – you couldn't live in these universities, and social and cultural life happened primarily in the towns and cities, not at the universities. The European universities were not places for living: they were centres for learning and research, factories for higher education that needed the town and its unique functions. They were parasites of the town, which had given them the fields in the countryside on which they could mushroom.

Figure 1
Universität Bielefeld
SOURCE: HTTPS://WWW.UNI-BIELEFELD.DE/UNI/
CAMPUS-BAUEN/

6　Campuses in a small European town

After World War II, Trondheim had two separate institutions for higher education, but no university. With the ideal of education for all, and the belief in an upcoming student boom, it was decided to: a) merge the two institutions under a university umbrella, and b) construct buildings that could house the whole university. The making of the university in Trondheim shares some similarities with medieval processes, as it is a *universitas*, an organization of different *scholae*; still, it followed Humboldt's ideals and became one university. It sought to fulfil the Humboldtian ideal by not only establishing the university as a unity over the rhizomatic structure of the present institutions, but to organize it with a completely new building complex for the whole university.

This new building complex was located on the edge of the town of Dragvoll, about 5 km from the centre of Trondheim. The university needed space, as the building complex was intended to be the largest in Norway. In the original plan, the University Centre (as it was called) was a complex that would stretch over 700,000 square meters.

The winner of the architectural competition for the University Centre was *Henning Larsens Tegnestue*. Larsen was following the trend in university design, and the centre at Dragvoll was to be built with prefabricated concrete. However, Larsen's thinking and design seemed to have some Nordic flair. Larsen was clearly not following the ideal of isolation:

instead, he was criticizing the way university buildings were formed around the world. He criticized the functionalist way of thinking, with its belief in "differentiating society" (Larsen, 1970, p. 2). In such societies, "universities are becoming alienated and alienating giant complexes. Ghettos" (Larsen, 1970, p. 2). The functional division of universities into ghettos would eventually "strangle" them, "partly because of the lack of internal communication, partly because of lack of communication with the rest of society" (Larsen, 1970, p. 2).

One would think that Larsen's inspiration was old medieval university towns. This was partly true, but he was more interested in the 19th century structures of steel and glass passages, which Walter Benjamin made famous in his *Passagen-werk* (Benjamin, 1983). Larsen probably also had Oxford in mind – not so much the town, but the glass-steel Covered Market in the centre of town. An association was certainly made with a town like Oxford: Dragvoll was seen as "building groups around a network of walking streets, which in the end will become a net with buildings and streets of 100 meters, which resembles Oxford and the old town centre of Trondheim" (Statens bygge- og eiendomsdirektorat, 1994, p. 4). As in these old towns, the size and height of the buildings would be limited: at Dragvoll, the buildings would be no more than three stories high.

It was the openness to, and potential for, communication that was the main principle for campus design to Larsen. The huge building complex should be regarded "not as a visible building or a physical structure, but as a global and open net of information" (Larsen, 1970, p. 19). The streets, covered with steel-and-glass constructions, would make it possible to move around on campus without being exposed to the harsh climate of Trondheim. Larsen also designed green areas (*grønnegårder*) inside the complex, as well as agoras and places to sit (like in a theatre).

Perhaps Larsen would have liked to locate the university in town: he was concerned about communication between the university and society. In a way, he was thinking in mode 2 of knowledge production, as it is defined by Gibbons et al. (1994). However, Gibbons et al. mostly define mode 2 as the way knowledge is made inside universities, as "transdisciplinary" and by "a constant flow back and forth between the fundamental and the applied, between the theoretical and the practical" (Gibbons et al., 1994, p. 19); in contrast, Larsen was concerned with communication with the rest of the world. He was a little sceptical about the University Centre "in spite of a good public transportation system, being isolated from the town centre of Trondheim" (Larsen, 1970, p. 8). Still, he believed that when "the university expands, it will be parallel with the expansion of the city. Time over time, there will be a stronger integration with the town" (Larsen, 1970, p. 8). Even if integration with the town was the ideal, Larsen also saw the benefits of the centre having close contact with "green areas and the forest" (Larsen, 1970, p. 36).

At least in his writings, Larsen reduced the role of the buildings and the architectural design. In his view, the buildings should be *passive contributors*, making the space and areas for academic conversations. However, as visitors can observe, the centre creates a specific atmosphere. When I was a student at the technical college at its campus close to town, my first visit to Dragvoll gave me a sense of comfort. People (students and teachers) were moving around the wide streets lined with plants and green areas, with light coming in from above. This contrasted with the technical college, with its narrow and dark corridors, where students mostly moved from one lecture to another.

Figure 2
Dragvoll universitetssenter (with 130.000 m²)
SOURCE: HTTPS://WWW.ADRESSA.NO/NYHETER/OKO-NOMI/ARTICLE7339221.ECE

7 Mode 2 in knowledge production?

Today, the board of the university in Trondheim – now called Norwegian University of Science and Technology (NTNU) – has decided to close Dragvoll and sell the building complex to the town. The vision of a unified university at Dragvoll has been abandoned, and the buildings – designed with a vision for what a university should be – will be used for totally different purposes. Trondheim is an example of a new wave of university thinking: universities are to be sites for excellence. The university in Trondheim must become "excellent and internationally acknowledged" (Visjonsgruppa, 2014, p. 62). The agent for realizing this goal is not the old campus at Dragvoll, but a new campus at the older campus, where the technical college was located.

Henning Larsen wanted to create space for free and open communication that was not bound to any specific purpose except learning, research and development; the idea of the new campus is based on another idea of what is important at a university. The main purpose of the university is no longer the disciplinary departments or the faculties, but instead interdisciplinarity. The vision for the university states that in order to:

solve the complex societal demands in the future, we need to work across the borders of the traditional disciplines in order to find new solutions… Transdisciplinarity is totally central in order to solve big and complex problems (Visjonsgruppa, 2014, p. 10).

The university seems to opt for mode 2 of knowledge production, which, according to Gibbons *et al.*, is defined as being "transdisciplinary", and includes "a wider, more temporary and heterogeneous set of practitioners, collaborating on a problem defined in a specific and localized context" (Gibbons et al., 1994, p. 10).

The university has turned into a problem-solving institution through transdisciplinarity, or collaboration across disciplinary borders. Such a definition of the university breaks with the pre-modern, faculty-organized view and with the modern, disciplinary-oriented view. With this new definition, the organization of space becomes a central issue: "The transdisciplinarity needs a living infrastructure which binds the campus together, with rooms that support conversations, group work and supervision" (Visjonsgruppa, 2014, p. 10). Moving the whole university in Trondheim to one campus implies that "most of the research groups will be gathered in a limited area, where one within 15 minutes of walk will be able to reach all the central functions of the university" (Visjonsgruppa, 2014, p. 108).

While the idea of transdisciplinarity may be a sign of a new *zeitgeist*, the idea of having everything gathered on one campus is, as we have seen, a modern idea, arising with Napoleon's *Université impériale* and with the epistemology of Wilhelm von Humboldt. While this idea was realized in the green fields on the outskirts of town, NTNU wants to gather the whole university at an old campus in town. Obviously, this can cause problems, as the plan will involve the use of space and buildings that are used for other purposes than research and teaching. The most-debated topic has been how NTNU originally planned to use the green areas around the old campus for new buildings and facilities (Furberg, 2017). The discussion of the campus has become primarily a discussion about space.

Paradoxically, the campus at Dragvoll would have realized the demands for space. However, while the campus at Dragvoll was based on an architectural plan, the decision to consolidate the whole university on the campus in town was based on a consultant report from the consultant group Rambøll Management Consulting (Rambøll, 2016). While Larsen spoke about streets, buildings, spaces and areas, the report from Rambøll stated that:

The concept development is based on a so-called four step methodology, where one has investigated all possible possibilities to solve the societal need with the least possible public investment, where costly new investment is the last step on the ladder (Rambøll, 2016, p. 8).

After the decision was made on the basis of the consultancy report, the architects were let in. While a competition is being held on how to expand the areas of the old campus, no ultimate solution has been developed on what should be built and where. The process is still in a planning stage, and no decision has yet been made on what to build.

While the rhetoric for the new campus is in line with the description of mode 2 of knowledge production – with its transdisciplinarity and orientation towards societal needs – the whole planning is in line with functional thinking, making the university an effective and functional unit within the town.

It is difficult, if not impossible, to say how the campus will look in the future. Most likely, it will adopt what Bent Flyvbjerg has called the "iron law of megaproject"; it will be "Over budget, over time, under benefits, over and over again" (Flyvbjerg, 2017, p. 11). The Dragvoll campus ideal was never fully realized according to the original plan, and the university has now already changed its campus plan by letting faculty move into buildings in the middle of town. As Dragvoll was never fully realized, buildings for higher education are used around town, and with the problem of space for the new campus, the university has to use existing facilities.

Figure 3
Possible campus solution
SOURCE: HTTPS://WWW.NTNU.NO/CAMPUSUTVIK-LING/2019/HER-VIL-NTNU-BYGGE

8   The lost *aisthesis*?

The modern idea of the university is that a university is a centre for knowledge production, a unified and functional unit in society. Humboldt's idea of pure science in isolation and freedom has had a tremendous impact on the process of building new universities. The idea was that knowledge production should be left to itself, and society was repaid with trained professionals and research findings. The spacing of the university has become the most important question in its planning. Ideas differ on what the spacing should mean; for instance, for Henning Larsen the most important principle was to generate space that enabled communication. Larsen's understanding of the university – eschewing the large megastructures of other new European universities – was based on an epistemology of space. Larsen sought to promote communication through the spatial planning of the university.

However, Henning Larsen did not only see communication as a way of exchanging information. He wanted the university to be like a town: one should live and behave on the campus as one would in town, and in Larsen's vision, the university campus outside town could and would be incorporated into the town. Although inspired by the architecture of shopping galleries in the 19th century, his idea of the university was of a place integrated into the town – more like the medieval idea of the university than the modern idea.

As the university is now closing the campus at Dragvoll, it is a sign of the campus not working. First, it is not in accordance with the thinking of interdisciplinarity; however, that goal could have been achieved at Dragvoll. Still, one important failing is that the campus at Dragvoll, in spite Henning Larsen's intentions, did not work as a town. Like most campuses on city outskirts, in the evenings the campus is empty of people. Students have also often found Dragvoll as lacking the environment of a town. An architectural student once said that "the street is made to handle activities, but there is no one biking, playing football, smoking or playing theatre…The street area was meant to be extroverted. It is now turning itself inwards" (Gullestad, 1997).

The new campus in Trondheim is in danger of encountering the same problem as Dragvoll, especially with the current ideas of how the campus should contribute to the social and cultural lives of student and teachers. It is possible that the campus will become a "learning factory" close to town, but still be like a ghetto for learning and research. The reciprocal parasitic roles of the university and the town will not support each other in fruitful interaction.

If we think of learning as needing different kinds of emotional stimuli – of affects to produce ideas and cognition – the modern campuses and the new campus planned in Trondheim can be said to be emotionally

monochromatic. The "colour" of the campus can be developed, as with American campuses, through aesthetic means and spaces for social life. However, the question remains whether the premodern universities do not still have an advantage: the landscape of the university is multitudinous, and its rhizomatic structure is integrated into the rhizomatic structure of the town. The town may be a parasite to the university and the university may be a parasite to the town, but through Michel Serres' analysis of the parasite, we know that this parasitic function is necessary to enable communication to take place, as communication is never a pure information exchange (Serres, 1980). Mode 2 in knowledge production is realized in the sense that higher education is not obtained in isolation, but can be found in the midst of other societal activities. Students and teachers can take advantage not only of the university buildings and spaces, but also of what the town has to offer in aesthetic qualities. The town provides a richer emotional landscape, and supports learners and teachers with a more varied palette of aesthetical impressions.

As a final remark, I would like to point to how one of Humboldt's most influential sources, his contemporary Immanuel Kant, thought about aesthetics. Kant defined the aesthetical as something *Übersinnlich,* extra-sensuous. He argued for a pure aesthetic and explicitly excluded *Reiz und Rührung*, stimulants and emotions (Kant, 1922 [1790], p. 62). Aesthetics should be as isolated as the "pure reason" from the body, and from what might affect the body. I think it is time to understand that this is not a fruitful perspective if we are to enhance learning. University planning should not be only about space and the design of buildings: it should be based on an understanding of the rhizomatic structures that are always operating behind the scenes, as well as the understanding that what we build and design affects the ways we learn and develop.

In ancient literature, the aesthetic was a concept that also included an emotional dimension. Aristotle did not relate it only to the visible, but also to the "sensation of the inner emotions" (Aristotle, 1926, p. 116). He saw the purpose of the poetic process – at least when it happened on a stage as tragedy – as raising specific feelings in the audience (Aristotle, 1995). In other words, the way things appear in front of us generates something in us. In this way, buildings perform emotions. The modern understanding of aesthetics is ignorant of this emotional dimension, especially after Immanuel Kant connected aesthetical judgment to cognitive capacity (Kant, 2005 [1790]).

Aristotle. (1926). *Art of rhetoric* (H. Rackham, Trans.). Cambridge, MA: Harvard University Press.

Aristotle. (1995). *Poetics. Longinus: On the sublime. Demetrius: On style* (S. Halliwell, Trans.). Cambridge, Massachussets: Harvard University Press.

Aslaksby, T. (2011). Hvem tegnet Universitetet – Grosch eller Schinkel? *Byminner,* (3), 22-27.

Aulard, F. A. (1911). *Napoléon Ier et le monopole universitaire: Origines et fonctionnement de l'Université impériale.* Paris: Colin.

Barad, K. (2007). *Meeting the universe halfway.* Durham, NC: Duke University Press.

Beckwith, C. I. (2012). *Warriors of the Cloisters: The Central Asian origins of science in the medieval world.* Princeton, N.J.: Princeton University Press.

Benjamin, W. (1983). *Das Passagen-Werk.* Frankfurt am Main: Suhrkamp Verlag.

Boudon, J.-O. (2007). Napoléon et l'Université. *Commentaire,* (1), 170-182.

Braidotti, R. (2013). *The posthuman.* Cambridge: Polity Press.

Brandt, T., & Nordal, O. (2010). *Turbulens og tankekraft: Historien om NTNU.* Oslo: Pax.

Brockliss, L. (2000). Gown and Town: The university and the city in Europe, 1200–2000. *Minerva, 38,* 147-170.

Coulson, J., Roberts, P., & Taylor, I. (2015a). The future of the campus: Architecture and master planning trends. *Perspectives: Policy and Practice in Higher Education, 19*(4), 116-121.

Coulson, J., Roberts, P., & Taylor, I. (2015b). *University planning and architecture: The search for perfection.* Oxon: Routledge.

Craster, H. H. E. (1952). *History of the Bodleian Library, 1845–1945.* Oxford: Clarendon Press.

Dahl, T. (2004). Den rene diagnosen og den gamle terapien: Medisinsk praksis og medisinske fortolknings-regimer anno 1840. *Historisk tidsskrift, 83*(4), 613-632.

Dahl, T. (2019). The poiesis and mimesis of learning. In A.-L. Østern & K. N. Knudsen (Eds.), *Performative approaches in arts education: Artful teaching, learning and research.* London: Routledge.

Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain.* New York, NY: Avon Books.

Delanda, M. (2002). *Intensive science and virtual philosophy.* London: Continuum.

Deleuze, G. (1988). *Spinoza: Practical philosophy.* San Fransico, CA: City Lights Books.

Deleuze, G., & Guattari, F. (1980). *Mille plateaux: Capitalisme et schizophrénie II.* Paris: Minuit.

Dober, R. P. (1992). *Campus design.* New York, N.Y.: J. Wiley.

Fallan, K. (2008). Architecture in action: Traveling with actor-network theory in the land of architectural research. *Architectural Theory Review, 13*(1), 80-96.

Ferruolo, S. C. (1988). Parisius-Paradisus: The city, its school, and the origins of the university of Paris. In T. Bender (Ed.), *The University and the city: from medieval origins to the present.* New York, NY: Oxford University Press.

Flyvbjerg, B. (2017). Introduction: The iron law of megaproject management. In B. Flyvbjerg (Ed.), *The Oxford handbook of megaproject management.* Oxford: Oxford University Press.

Furberg, K. (2017). Etterlysning: Er det noen som vet hvor høgskole-parken er? Bygging i høgskolepark-en er en het potet, men ingen vet helt hvor den er. Retrieved from https://www.universitetsavisa.no/campus/2017/02/17/Etterlysning-Er-det-noen-som-vet-hvor-Høgs-koleparken-er-18366459.ece

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies.* London: SAGE Publications.

Grendler, P. F. (1999). The University of Bologna, the city, and the papacy. *Renaissance Studies, 13*(4).

Gullestad, F. (1997). Dragvoll – Visjonen som slo feil. Retrieved from http://org.ntnu.no/ud/dusker/html/9713/dragvoll.html

Hnilica, S. (2014). Systeme und Strukturen. Universitätsbau in der BRD und das Vertrauen in die Technik. *Wolkenkuchkuchsheim, 33,* 211-233.

Hughes, T. P. (1983). *Networks of power: Electrification in Western society, 1880–1930.* Baltimore, MD: Johns Hopkins University Press.

Humboldt, W. v. (1903 [1810]). Über die innere und äussere Organisation der höheren wissenschaftlichen Anstalten in Berlin. In *Gesammelte Schriften. Band X. Zweite Abteilung: Politische Denkschriften I.* Berlin: Königlich Preussischen Akademie der Wissenschaften.

Jack, A. A. (2019). *The privileged poor: How elite colleges are failing disadvantaged students.* Cambridge, Mass.: Harvard University Press.

Kant, I. (1922 [1790]). *Kritik der Urteilskraft. Fünfte auflage. Herausgegeben, eingeleitet und mit einem personen- und sachregister versehen von Karl Vorländer.* Leipzig: Felix Meiner.

Kant, I. (1991 [1798]). Der Streit der Fakultäten. In W. Wieschedel (Ed.), *Schriften zur Antrohopologie, Geschichtsphilosphie, Politik und Pädagogik. Werkausgabe Band XI.* Frankfurt am Main: Suhrkamp.

Kant, I. (2005 [1790]). *Kritik der Urteilskraft.* Frankfurt am Main: Suhrkamp.

Koch, H.-A. (2008). *Die Universität. Geschichte einer europäischen Institution.* Darmstadt: Wissenschaftliche Buchgesellschaft.

Larsen, H. (1970). *Universitetet i Trondheim: Beskrivelse av konkurranseprosjekt tildelt 1. premie.* S.l.: s.n.

Latour, B. (1988). How to write "The Prince" for machines. In B. Elliott (Ed.), *Technology and social change.* Edinburgh: Edinburgh University Press, 20-43.

Latour, B. (1992). *Aramis ou l'amour des techniques.* Paris: La Découverte.
Latour, B. (1999). *Pandora's hope.*

Essays on the reality of science studies. Cambridge, MA: Harvard University Press.

Latour, B. (2013). Facing Gaia. Six lectures on the political theology of nature. Being the Gifford Lectures on Natural Religion, Edinburgh, 18th-28th of February 2013. Retrieved from http://www.brunolatour.fr/sites/default/files/downloads/GIFFORD-SIX-LECTURES_1.pdf

Lemmings, D., & Brooks, A. (2014). The emotional turn in the humanities and social sciences. In D. Lemmings & A. Brooks (Eds.), *Emotions and social change. Historical and sociological perspectives.* New York, NY: Routledge.

Malcolm, N. (1958). *Ludwig Wittgenstein: A memoir.* London: Oxford University Press.

Nordtømme, S. (2015). En teoretisk utdyping av rom og materialitet som pedagogisk ressurs i barnehagen. *Tidsskrift for nordisk barnehageforskning, 10*(4), 1-14.

Parsons, T. (1939). The professions and social structure. *Social Forces, 17*(4), 457-467.

Porter, R. (1997). *The greatest benefit to mankind. A medical history of humanity from antiquity to the present.* London: Harper Collins.

Rambøll. (2016). *KVU framtidig lokalisering av campus NTNU. Konseptvalgutredning.* Retrieved from https://www.ntnu.no/documents/36266287/38463652/KVU_Rambøll.pdf/910a03ad-8883-4f83-87be-d8f-501d6639c.

Roth, G. (2011). *Bildung braucht Persönlichkeit: Wie Lernen gelingt.* Stuttgart: Klett-Cotta.

Schelsky, H. (1963). *Einsamkeit und Freiheit: Idee und Gestalt der deutschen Universität und ihrer Reformen.* Reinbek bei Hamburg: Rowohlt.

Schryer, S. (2016). Fantasies of the new class: New criticism, Harvard sociology, and the idea of the university. In P. L. Caughie (Ed.), *Disciplining modernism* (p. 147-166). Basingstoke: Palgrave Macmillian.

Serres, M. (1980). *Le parasite.* Paris: Grasset.

Serres, M. (2011). *Variations on the body* (R. Burks, Trans.). Minneapolis, MN: Univocal.

Statens bygge- og eiendomsdirektorat. (1994). *Universitetssentret på Dragvoll: del 1.* Oslo: Statens bygge- og eiendomsdirektorat.

Temple, P. (2008). Learning spaces in higher education: an under-researched topic. *London Review of Education, 6*(3), 229-241.

Temple, P. (2009). From space to place: University performance and its built environment. *Higher Education Policy, 22*(2), 209-223.

Turner, P. V. (1984). *Campus: An American planning tradition.* New York, NY: Architectural History Foundation.

Visjonsgruppa. (2014). *NTNU 2060. Visjoner for campusutviking.* Trondheim: NTNU.

Weber, M. (1922). *Gesammelte Aufsätze zur Wissenschaftslehre.* Tübingen: J.C.B Mohr.

Østern, T. P., & Dahl, T. (2019). Performativ forskning – sentrale teoretiske og analytiske begreper i boka. In T. P. Østern, T. Dahl, A. Strømme, J. A. Petersen, A.-L. Østern, & S. Selander

(Eds.), *Dybde//læring – en flerfaglig, relasjonell og skapende tilnærming* (p. 29-38). Oslo: Universitetsforlaget.

(Eds.), *Dybde//læring – en flerfaglig, relasjonell og skapende tilnærming*

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