"Science Cities" : Science Campuses and Clusters in 21st Century Metropolises

> Keynote

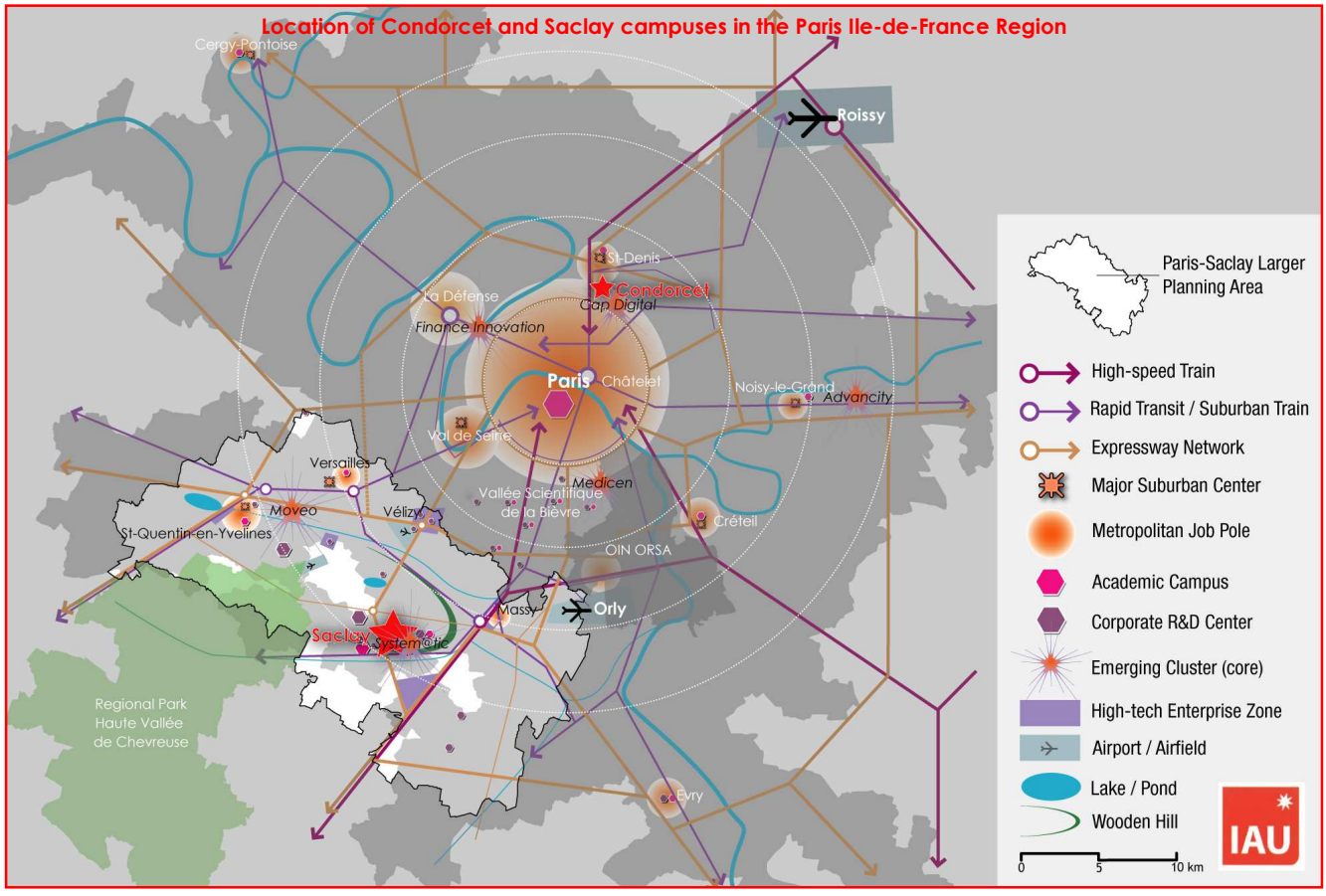
A study examining a pressing issue in Paris Ile-de-France

Creating science campuses that draw on an exchange of knowledge generated by different disciplines is a major focus for all cities seeking to attract innovative and creative R&D activities to their regions. These places are widely viewed as essential resources for the development of high-tech business clusters, which are pathways to value creation and highly qualified jobs. Yet this is not always the case, as demonstrated by the mixed results in terms of start-up and jobs creations at the large Adlershof project in Berlin, or the problematic gestation experienced by the Saclay technopole development for twenty years.

The selection of the Saclay and Condorcet projects[i] for the "Opération Campus", a vast building modernization program concerning a dozen French university campuses, engages the Ile-de-France region and many local authorities in this area; while these two projects will not create new universities, they will, however, significantly alter the landscape of graduate studies in Ile-de France. They not only differ in terms of the scientific disciplines they house and the extent of the building projects, but also regarding each specific territorial context. Issues relating to urban integration and the construction timeframe for these two campuses will therefore, by definition, be very different, especially as the surface areas, capacity and access via public transportation are not comparable.

Condorcet **will concentrate on the social sciences** and will occupy 180,000 sq.m of floor space and approximately 7.5 hectares (18.4 acres) on either side of the *Boulevard Périphérique*, to the northern edge of the city of Paris. This former industrial and logistical district of the Plaine St-Denis, is one of the most socially deprived area of the metropolis, yet also a growing digital media cluster. It is undergoing a major redevelopment process, making it one of the fastest-growing area, thanks its good public transportation network

Location of Condorcet and Saclay campuses in the Paris Ile-de-France Region



(metro, RER and tramcar) and its advantageous location in between the Roissy airport, La Défense and Paris.

Saclay **will specialize in engineering and the exact sciences** and will be developed on farmland 20 kilometers south of Paris, in an area already concentrating thousands of scientific researchers, but hardly accessible by public transportation. This super-campus spanning 900 hectares (2250 acres) is located in the heart of the "System@tic" NBIC cluster and close to the intelligent transportation systems one ("Mov'eo"). By the year 2025, it could accommodate up to 70,000 people[ii] and be serviced by an automatic metro.

Campus

According to Bill Mitchell, a campus is usually meant as *"a discrete, clearly bounded parcel of land with master-planned collection of buildings and open spaces. Access to the campus may be controlled by walls, gates, and traffic checkpoints. And separation from the surrounding city may be legal as well as physical (…) "* [iii]

"Adaptive" campus planning: lessons from the MIT

MIT is often cited as the archetypal, successful example of the science campus and regularly tops international university rankings. Bill Mitchell, former Dean of the School of Architecture and Planning for ten years, also served as Architectural Advisor to the MIT president in the early 21st century. He explains that there are three ways to control the development of a university campus: local urban planning codes linked to architectural guidelines; a ground plan associated with a proposed construction plan; and finally, flexible planning, based on the elaboration of specific responses to new opportunities and needs that occur in "real time[iv]". The MIT campus is, in fact, the product of these two last approaches. The first produced the Main Complex (1910-1930), which, with its "neoclassical Beaux-Art" style. It gives this part of the campus a monumental and somewhat austere and rigid appearance due to the mass and modular symmetry of this immense building with its so-called "infinite corridor". The second has produced, since the late 1990s, a series of remarkable buildings such as the Stata Center, designed by architect Frank Gehry.

Inaugurated in May of 2004, this very large building (70,000 sq. m of floor space) houses the Computer Science and Artificial Intelligence Laboratory and the Department of Linguistics; it very quickly became an iconic symbol of the campus. The design evolved and became more complex over time to incorporate a number of scheduling changes, including the last-minute addition of a parking lot initially planned to be constructed atop another building. The public space leading to the entrances of the shared parking lot under the Stata Center fosters impromptu encounters between computer specialists and researchers working in other departments.

The large circulation spaces on the ground floor were designed to encourage meetings and exchanges through the creation of nooks and crannies with natural light. These are propitious to small gatherings and meditation, especially as they have chairs and blackboards, and they lead to such diverse spaces as the day-care center, auditoriums, classrooms, cafeteria and so on.

Stata Center and Brain and Cognitive Sciences Complex (©Philip Greenspun)

With the Brain and Cognitive Sciences Complex, constructed opposite the Stata Center, as well as the Whitehead Institute for Molecular Biology and the Broad Institute for Genomics, MIT created a major center in a relatively outlying sector of its campus, adjoining a former industrial zone. This cluster is now the hub of a flourishing high-tech district that is rapidly becoming a world leader in biotech research. But according to Mitchell, it has never been planned as such: "*The key mechanism in this* [process of urban transformation and economic clustering] *is the transfer of technology from on-campus laboratories to nearby off-campus start-ups run by entrepreneurial faculty members, part-time students employees and recent graduates.*" (…) "*To understand its genetic logic, you had to look neither for an idealized representation of the subdivision of scientific and engineering effort nor for statues and symmetry, but for the varied ways in which global research and economic imperatives had encountered local exigencies in a complex, historically contingent, continually evolving urban fabric.*"[v]

University strategies and urban strategies : towards closer relationships

One of the chief complaints concerning university campuses created in France over the last 50 years is that they are cut off from the world in large, isolated peri-urban enclaves. They illustrate a good number of the insurmountable failings of specialized workplaces produced by contemporary urban planning: they have large landscaped areas, but these are often poorly maintained and therefore unattractive; they are underequipped in terms of social and athletic infrastructure; and they are deserted at night and during school holidays.

Campuses recently constructed as part of the "U2000" and "U3M" French government plans, have tried to address these problems by favoring smaller, but also more centralized sites, which are therefore more accessible by public transportation and closer to urban activities. The primary goal of the U3M plan was to align the spatial redesign of graduate school and research facilities with urban structuring projects.

In the framework of this scheme, the Paris VII University, the Paris-Val-de-Seine architecture school and INALCO language institute were therefore able to integrate the master plan of the Masséna district in the Paris-Rive Gauche urban development. Academic buildings either fit into revamped industrial structures or into the "open block" grid designed by Christian de Portzamparc and their massing is akin to that of other buildings in this sector.

Model of the Masséna district (© Atelier C. de Portzamparc)


View of the Grands Moulins park (© Atelier Ah-Ah Paysagistes)

This hybrid urban space—both academic campus and neighborhood of apartments, shops, offices and parks—aims to recreate the urbanity of the Latin Quarter by adapting it to contemporary lifestyles. Overall, some 30,000 students, researchers and professors will soon be accommodated in a compact "university quarter" on some 200,000 sq.m of floor space and merely 26 hectares (65 acres).

A roundtable discussion organized by the IAU-IdF[vi] stressed the difficulty of reaching an agreement on the goals, the driving forces and physical features that contribute to the success of a campus. What criteria can be used to assess this success? Intellectual productivity, as for the international classification of the University of Shanghai? The number of start-ups incubated or the number of industrial patents registered by a campus laboratory? Vibrant social activities? The quality of the architecture, the facilities or its urbanism? This study will give more emphasis to this last issue, while attempting to determine its impact on other elements—the first being the link between the campus and the local economic system, i.e. the metropolitan clusters.

"Cluster": a protean concept

The identification and mapping of the primary international clusters undertaken by the IAU-IdF[vii] revealed that this concept, which overlaps sectoral and spatial aspects, is complex and multifaceted, and therefore difficult for many territorial decision-makers to understand. Updated and theorized by Michael Porter, in practice these clusters are often quite diverse, depending on the local context, and are therefore far from homogeneous.

Let's examine the methodology first of all. Paradoxically, the success of the concept, given the lack of a clear definition, makes it increasingly vague: everything is viewed as a cluster, from the moment a geographic concentration of similar activities or a strongly innovative network of players appears. The concept sometimes artificially combines highly diverse initiatives aimed at grouping together people from industry and science so that they can meet together, organize and develop formal or informal projects within these networks, facilitating the exchange of information and attracting new talent with its dynamism. Public authorities then intervene to target their own economic development initiatives, whether this involves the construction of infrastructure (roads, incubators, science parks and so on), investment in training and science, or assistance in setting up strategic or financial structures (risk capital, competitive intelligence methods).

In practice, the success of certain clusters has drawn attention to external economies that can be produced by the concentration of knowledge and local environments, thereby stimulating the competitiveness of regional economies. Silicon Valley, the Catalan clusters and the German *Kompetenznetze* are among the best-known examples; they represent very different realities. Hence, certain policies or public initiatives on behalf of clusters seek to foster a strong territorial base for the people and institutions involved, acting as magnets for activities that tend to group together in clusters, much like the emblematic Silicon Valley, as well as the Italian Industrial Districts. Other initiatives[viii] seek to stimulate networks of skills and intensify links within a region or a country, as does the German *Kompetenznetze*, for example, in promoting innovation and creating a positive economic impact on the local level. Finally, some of the initiatives are situated somewhere between the two, based on efforts to stimulate the core of a localized cluster and to facilitate better networking of skills, around and from this "center of gravity."

Cluster

According to Cooke and Huggins, *"Clusters are geographically proximate firms in vertical and horizontal relationships, involving a localized enterprise support infrastructure with shared developmental vision for business growth, based on competition and cooperation in a specific market field."*

Seeking serendipity

By analyzing the issue of the urban amenities required for a vibrant academic campus or a dynamic high-tech cluster, it appears that planners attempt to reconcile the functions traditionally assigned to university campuses (teaching, research, technology transfer, athletics, etc) with those of business parks (business and support services) and urban centers (housing, leisure, business and culture), and even to merge several of them together in a single building.

While it is rare to see this combination fully operational on a university campus, for both administrative reasons (a university cannot provide all the services and infrastructure a population requires on its own property) and for safety concerns (certain laboratories conduct sensitive and/or dangerous research), a harmonious organization of the different uses in the entire zone forming the campus can nonetheless be achieved, with the goal of maximizing the interactions between the town and the university and to foster an essential ingredient to innovation: **the effect of serendipity.**

This amenity provided by a place or an organization pattern—fostering chance encounters and collaborative work—eventually stimulating creation, innovation and scientific discovery, seems first of all evolving from the way the various elements of a university project fit together and connect with those of the surrounding urban or territorial project.

According to François Ascher, *"One realizes that modern hyper-functional cities, where nothing else is done beyond what was planned for it, are boring and not conducive to creativity. Hence, one discovers the pleasure, but also the performances of the city and its public spaces, of these places where unexpected things happen, where you can meet new people, where random encounters take place."*[ix]

Serendipity

Jacques Lévy, in an article discussing serendipity, wrote that *"by multiplying the resources to draw from while mobilizing them using suitable filters, it is possible to create more favorable conditions to encourage innovation. This creates an extremely stimulating contradiction between the impossibility of programming creation and attempts to make this possible, hence the idea of increasing what can be called 'the productivity of randomness'."*[x]

Social and pedagogical developments

New technologies, the development of learning via interdisciplinarity and experimentation now play essential roles in university teaching. The Bologna Process, which standardized curricula and diplomas according to the Anglo-Saxon model of the Bachelor's, Master's and PhD degrees, makes it easier for students to move from one country to another and is a powerful vehicle for cultural diversity. Furthermore, graduate education is becoming increasingly accessible to other social categories and broader ages, whether through adult education, technology transfers, or through popular science.

To remain attractive, universities must therefore address all these changes by updating their training offer and remodeling their campuses, because it's not enough to merely house traditional teaching activities; they must now participate in and promote pedagogical development and closer links between science and society.

Sustainable development (often defined restrictively as energy efficient) is one of the most preoccupying challenges facing academic facility managers today, because universities must be in the forefront in this field, not only for their reputations, but also and above all to lower their operating costs. They must be exemplary in this respect, and therefore must become "living laboratories" for qualitative progress.

International case studies

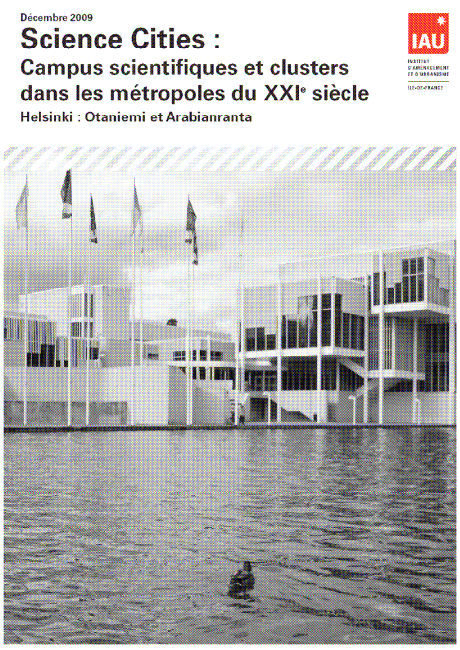
With its "Science Cities" study, the IAU therefore aims at crossing an analysis of the university real estate project with that of the metropolitan economics project. It seeks to understand how campuses are integrated both physically in their areas, and economically in the industrial ecosystem of their city. In particular, it examines the cooperation and partnerships developed by the universities with economic and political stakeholders.

Numerous projects and ongoing scientific research campuses exist abroad. In Anglo-Saxon cities, which already have an extensive academic infrastructure, these operations most often concern extensions or restructuring of existing university campuses rather than new projects—with the exception of R&D centers and small or medium high-tech firms, which are usually developed in new science parks and are privately designed and managed.

Many of these operations have adopted the term "science city" (ex. Adlershof Berlin, ETH Zurich, Kista Stockholm). Is this merely a fashionable term of the moment, as "technopole" once was, or the sign of a more durable evolution in urban planning? This is what the study will seek to examine.

In a work of international benchmarking covering urban, academic and economic aspects, it is important to analyze operations in metropolises that have a reputation for innovation and excellence in these three domains. Even if European cities are more familiar in terms of morphology and government, it is also essential to look at North America, which is still a reference in terms of synergies among universities, research and industry, as well as Southeast Asia, which now demonstrates a dynamic approach to innovation and R&D.

Case studies will be selected to cover a large range of situations: academic campuses and business parks with a strong concentration of R&D activities; sites located in city centers as well a peri-urban sites; new projects, along with extensions and remodeling plans. The first monographs published in early 2010 therefore dealt with two European cities—Helsinki and Zurich—which are small in comparison to Ile-de-France, but exemplary in many ways.



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The IAU-Ile-de-France

In 1960, a government initiative gave rise to the Institut d'Aménagement et d'Urbanisme (IAU) of île-de-France in an effort to establish a master plan for the Paris Region. Since 1983, the IAU île-de-France has been affiliated to the Île-de-France Regional Council. With 40 years of experience in the development of the Paris metropolis, it has progressively become involved in a wide range of urban development and planning projects on an international scale. Today, it enrolls 200 staff members among whom 75% are professional from various disciplines. Its scope of activities encompasses strategic planning (master plan, open space scheme, regional development plan for tourism, landscape scheme, town-planning policy, free urban zones, etc.), public policy consultancy in education and training, health, housing, leisure activities, culture, heritage, economics, environment, transportation, etc.

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[i]-As well as three other sites: Paris, Cergy-Pontoise and Paris-Est/Marne-la-Vallée. The government would like these reconstruction and reconfiguration efforts to both save money in terms of operating costs as well as to boost the worldwide visibility and productivity of university research in the Ile-de France region.
[ii]- i.e. a 50% increase from 2007 figures, not including workers of the firms that could cluster around the campus.
[iii]- William J. Mitchell. Imagining MIT. Designing a Campus for the Twenty-First Century. MIT Press (2007)
[iv]- William J. Mitchell, op.cit.
[v]-William J. Mitchell, op.cit. p.99.
[vi]-"Campus: Quels enjeux pour le développement économique de l'Ile-de-France?" IAURIF, 14/09/2006
[vii]-"Clusters mondiaux: Regards croisés sur la théorie et la réalité des clusters," IAU-IdF 2008
[viii]-In France, this is, of course, the policy of "Pôles de compétitivité."
[ix]-Preface "De la sérendipité dans la science, la technique et le droit," L'Act Mem
[x]-Jacques Lévy, *Serendipity*, (www.espacestemps.net)