Changing authority relations within French academic research units since the 1960s: from patronage to partnership

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1. Introduction

Much recent research has focused on how intensified competition for resources and increasing demands for relevance and accountability have affected patterns of authority relations between academics and various stakeholders (the State, companies, research councils, etc.). Such effects may be visible at the bottom level of individual researchers or research teams (Leisyte, Enders, and De Boer in this volume), which are the elementary units of scientific production (Knorr-Cetina, 1999), as well as at a more aggregated level, that of the institutions teams belong to and whose nomenclature and characteristics vary across countries: university departments (Morris, 2002), institutes and research centres (Stahler and Tash, 1994, Geiger, 1990, Etzkowitz and Kemelgor, 1998), research units or laboratories (Joly and Mangematin, 1996). These studies of "Organized Research Units" (to draw on the generic term proposed by Stahl and Tash (1994)) usually focus on how ORU cope with external pressures and defend their professional autonomy against external claims on the products of their research. In contrast, there are only a few investigations on how external drivers for change affect authority relations within ORU, and more specifically between research teams and the administrative head of the unit.

This chapter focuses on the reconfiguration of these intra-organizational authority relations as a result of structural changes affecting the public science system. It argues that the understanding of these intra-organizational dynamics is crucial as the management of research is still a decentralized and distributed process. Because ORU do not simply undergo external pressures but also develop their own strategies, such intra-organizational authority relations affect the way ORU resist these pressures or, on the other hand, how fast they adapt to them.

This study addresses these issues in a specific subtype of ORU, the French "mixed research units" (*unités mixtes de recherche*). It rests on three longitudinal case studies over three to four decades in the life-sciences. The life-sciences are particularly interesting because they are highly symbolic of the structural reorganization of the public sciences: the growing requirements for relevance, accountability and management of academic research (Morris in this volume); the increased emphasis on project-based funding from public and private stakeholders (Poti, 2001); and the rapid growth of evaluation schemes and performance measurements (Whitley, 2007). Finally, France provides a good example of a stratified "state-shared" public science system (Whitley in this volume) in which the central state and to some extent scientific elites constituting academic oligarchies traditionally had the most influence on research strategies and performance standards, but where the authority of employment

organizations and funding agencies has increased during the last decades.

The chapter argues that there has been a shift from the "patronage" type of authority relations within ORUs, predominant in the 1960s in France, to the "partnership" type as a result of three major transformations of the public science system concerning: a) the recruitment and promotion procedures of academics, b) the funding of research, and c) evaluation procedures. It explains how these transformations have modified the roles of directors of research units and of team leaders, and consequently intra-organisational authority relations. It also shows how, in turn, these changing authority relations affect the scientific strategies of the mixed research units.

The chapter is structured as follows. The next section gives some background information about the French research system and continues with a brief description and justification of the approach adopted. The third section describes the two types of intra-organizational authority relations and summarizes the transition process from "patronage" to "partnership" within the three research units studied. The fourth section outlines the structural conditions supporting the establishment of each ideal-type of authority relations and the causes of change, particularly the structural changes in career systems, funding and evaluation, which gained overall importance in the 1980s and 1990s and gave rise to the partnership type of authority relations. Finally, the fifth and last section analyses the impact of these changes on the research unit's strategies.

2. Three longitudinal case studies

2. 1. An overview of the French research system: French mixed research units

After WWII, the state reorganised the French public science system around large national public research organizations (PROs) which are either generalist (such as the interdisciplinary CNRS with 32.000 staff in 2008) or mission-oriented. These PROs manage almost all ORUs which are the cornerstone of French academic research. In comparison with the research units to be found in other countries, French research units are distinctive in three major ways: their relations with academic departments, their staff composition, and their internal organization.

Relations with academic departments. PROs were created outside universities (in order to remedy the weakness of university research), so that most research units were originally only managed by PROs and were independent from universities. Since the 1960s however, as argued by P. Larédo and P. Mustar (2001), this traditional view of the French research system as a dual one (with strong research units administrated by PRO on the one side and weak university research units on the other) has been challenged. The most significant change deals

with the rise of "mixed research units", managed in common by a university and one or several PROs. The CNRS started such partnerships in the 1960s and other PROs followed the same direction. Mixed research units are thus the new organizational standard, blurring the boundaries between universities and PRO, as table 1 illustrates.

Table 1 about here

Staff composition. French academics are state civil servants of the French state. The main difference between France and other countries is that the share of permanent staff is much higher in France (80% among which 15% are technical staff as shown in table 2). Another interesting feature is that the permanent research staff of mixed research units is composed of university academics (appointed by the university, having teaching duties and spending their research time in the research unit) and PRO researchers (appointed by the PRO, with no teaching duties)

Table 2 about here

Internal organization. The average size of CNRS mixed research units is around 50 members, a figure which however covers a broad diversity in terms of size, composition and activity profile (Joly and Mangematin, 1996). All mixed research units affiliated to the same PRO fall under the same statutory framework defined by the PRO and the university. They are first created for a limited period of time (usually for four years) after going through a selection procedure carried out by the PRO and the university. They receive recurrent funding as well as administrative, technical and scientific staff. Their affiliation can be renewed for four-year periods so that a significant part of research units are quite long-lasting organizations. To take an example from the CNRS, 31.1% (in chemical sciences) and 13.2% (in life sciences) of the research units were created more than 15 years ago[2].

The relations between PRO / universities, the director of the research unit, and the research unit staff, also follow formal rules. The *director of a research unit* is an academic nominated by both the PRO and the university (after proposals made by the research unit council). He or she is the official representative of the research unit. As the research unit does not appoint the permanent research staff (university academics and PRO researchers), the director is unable to exert formal authority over them. Most research units are organized into research teams managed by *team leaders*. Teams are, as mentioned above, the elementary units of scientific production (Knorr-Cetina, 1999, Poti, 2001). Each team is also "mixed" in the sense that it is composed of PRO researchers and university academics. Team leaders launch research

[2] Source: CNRS database (2004), data analysis Séverine Louvel.

programmes, manage research contracts, and hire PhD students and post-doctoral researchers. However they have no more formal authority over the permanent research staff than directors of research units. Finally, a *research unit council* is composed of representatives from the administrative, technical and research staff (permanent and contractual researchers). It plays a consultative role in proposing guidelines and advising the director on research orientations.

2. 2. The study

Longitudinal case studies are particularly appropriate to capture intra-organizational dynamics extending over several decades (Siggelkow, 2007). In this study, fieldwork was conducted between 2003 and 2005 in the second largest French academic centre (11,000 academics spread over more than 200 research units). Preliminary interviews with natural scientists revealed striking differences in authority relations and allowed identification of two polar cases (here called White and Green). Authority relations between the directors and the teams in these polar cases differed greatly up to the 1990s, but seemed to converge in recent years. Because of this, White and Green appeared as particularly favourable cases for retracing the transformation of authority relations. A third case, named here Red, was added during the study: Red was going through a deep internal crisis, which led to its break-up shortly after the end of the study. This research unit thus presented an excellent opportunity for evaluating the consequences of changing authority relations on scientific and organizational strategies. Table 3 summarises the principal characteristics of the three cases. The research material is mostly composed of 103 interviews with members of the research units (and also with scientists who left them), and of archives (minutes of meetings, assessment reports, correspondence with PRO and universities, etc.). I also gathered additional material for White and Green through hallway discussions, attendance at meetings and other events – such as PhD defences - as I stayed full-time in these research units during several months.

Table 3 about here

Interviews were firstly compared to records in order to limit retrospective shifts (Leonard-Barton, 1990) such as the over-evaluation or under-evaluation of the importance of an event. Oral and written sources were also cross-checked during interviews and data analysis. Data interpretation was oriented towards the way directions of research units exert authority over their teams since the research units' creation, authority being defined here as the influence on their strategic autonomy and capabilities, notably pertaining to research priorities, resource allocation, and attribution of reward and recognition (Whitley in this volume). Authority relations were related to the direction's formal authority well as to the informal mandate

(Hughes, 1996) granted by team leaders. Comparison within and between the cases reveals two distinct ideal-types of authority relations, described here as "patronage" and "partnership". It also appears that all three research units fall currently under the partnership type of authority relations, and they all experienced the patronage type of authority at one point before the 1990s.

3. Types of authority relations: from patronage to partnership

3. 1. Patronage type of authority relations

In the 1960s and 1970s, directors of French research units played the role of "patrons" toward their teams (Clark, 1973). Clark defines patronage as an academic system in which the power is centralized in the hands of several professors, who dominate both the scientific production market and the market of academic positions. These patrons supervise a small number of "protégés," who are destined to succeed them, of which they control the access to work means, to scientific recognition, and lastly to career progression. Clark designed his model to describe the insular system which characterizes the Paris Faculty of Arts up to the middle of the 20th century. The expansion of French academia which occurred throughout the second half of the 20th century and which has been remarkable during the 1960s and the 1970s [3] may have relaxed patronage relationships, yet not put an end to them at that time. Defined as a patron, the director of the research unit draws his authority upon domestic principles (Boltanski and Thévenot, 2006) where the research unit appears as a family: his relationships to the team leaders are highly hierarchical and personal. As a patriarch, the director of the research unit enforces the rights and duties of each team, ensures their prosperity and imposes them mutual aid and generosity.

Highly hierarchical relations based on scientific legitimacy and on mentoring

In this type, the director keeps, sometimes years after team leaders formally become his equal, scientific authority over his former protégés and has *scientific legitimacy* in deciding which research tracks have priority and in orienting the professional commitments of the teams. The difficulty of contesting his or her legitimacy is reinforced by the fact that every criticism means disavowing a tutelary authority. Moreover, most team leaders are former doctoral students of the director, locally recruited and promoted thanks to his support. Academic

[3] At that time a dramatic increase in the number of students was followed by a spectacular increase in the number of academic positions. Between 1961 and 1971 university academic staff went from 7901 to 30546, or an average annual growth of 14.5%. Afterward the annual rate of growth oscillates between 0 and 4%. Source: CERC (1992).

inbreeding has been particularly salient at Green as well as at White, although to a smaller extent, as seen in table 4. The director positions himself here as *team mentor*, at the same time scientific counsellor and career protector. He protects each team's development using his wide-ranging powers in the academic world: *"Dave's policy was to favour people's career. Green was really like a "rank A publications factory", which meant that senior people have really extraordinary CVs"* (Former team leader at Green from 1973 to 1995).

Table 4 about here

Highly personalized relationships: loyalty debts and protection

Relationships between the team leaders and the director are characterized by strong loyalty debts, the team leaders staying indebted for their research apprenticeship and for direct help in their academic career. The director feeds these highly personalized relationships and these loyalty debts by protecting teams against external pressures. This protection rests notably on the banning of competition between teams by installing each team in a scientific niche: "*We always thought here that people should not compete against each other. In my opinion that's the role of a good boss, to know how to distribute themes so that people are not in competition with each other and at the same time let them room for manoeuvre. Because in research there is room for everyone. We can work on the same theme without walking on each others' toes.*" (Former team leader at Green from 1973 to 1995).

Furthermore, comparison of team's relative performance has always been as a taboo subject. Introducing internal discussions on this topic would be putting a fox in the hen house. Finally, some directors promote *financial cooperation* between teams while merging all third-party money or taking a significant percentage of it. Green's teams for example merge the entirety of their contractual resources. This rule pinpoints that the director attaches a great importance to the teams' mutual financial aid. It was established from the very beginning, at a time when project-based funding was still limited and considered a bonus improving the environment for research. The director was also the main contract manager: by bringing the largest contribution to this "common pot", he was the first to demonstrate the virtues of generosity. Reciprocity rests here on the principles of social exchange (Blau, 1967) in which gifts and counter-gifts are financial or non-financial (services, investment of collective interest in the administration, training...) and given to whichever member of the community.

Green, White and Red are not subjected at the same time and in the same way to the patronage type of authority relations. Consequently, partnership emerged at different times in

these three research units. Patronage was strong at Green from until the 1970s to the 1990s: the research unit was then successively managed by two founders who belong to the small elite of their scientific community and who had a free hand to exert their authority as patrons. Moreover, these two directors were deeply committed to patronage, which they considered the most efficient way to run a research collective. For instance, the second director still encouraged financial cooperation and mutual aid between the teams in the 1990s, after each team gained autonomy in competing for project-based funding. The move to the partnership type of authority relations occurred at Green in the 1990s and was closely related to a generational change among directors and team leaders. The research unit was no longer managed by one of its founders (who are however still working in it), but by scientists who had just been promoted to a senior position. The director's institutional position no longer gave him the far-reaching powers needed to exert patronage over his team leaders. Furthermore, the director as well as team leaders were now highly critical of the domestic principles upon which patronage relies. Among the bones of contention with the founders was, for example, the director's legitimacy in orienting team leaders' professional commitments in return for his career mentoring.

Red experienced a similar move in the 2000s. Until then, it was managed by its founder who was considered as the protective patriarch of a small family. Patronage was suddenly replaced by partnership with the appointment of a new director in 2001. Contrary to Green's new director, he was an "outsider" who did not previously work in the research unit. His intention to get rid of patronage, which he considered to be counterproductive, caused overt conflicts with the former director as well as with other members of the research unit.

Finally, White appears as a hybrid type from the 1970s to the 1990s before completely fitting in the partnership type of authority relations. Indeed, the research unit was then successively managed by two founders who are "patrons" in the sense that their high status in the scientific community granted them high scientific legitimacy and their institutional position enabled them to exert control over team leaders' careers. However, team leaders benefited at that time from considerable autonomy in managing their research contracts so that, for example, the teams' financial cooperation remains limited. Patronage completely disappeared in the 1990s with a generational change among team leaders and with the arrival of a director who was – as at Red – an "outsider". As was the case in the two other research units, the institutional conditions were no longer favourable to the patronage type of authority relations and patronage fell into disfavour with the director and the team leaders.

3. 2. Partnership type of authority relations

Since the 1990s, relationships between directors and team leaders have become closer to the ideal-type of collegial relationships (Waters, 1989) insofar as directors are looked on as *primus inter pares*. However, directors still have some authority over the team leaders, which can now be characterized as a partnership type of authority relations. Directors draw their authority on their ability to promote the teams' interests and do not usually interfere in their scientific strategy.

Weak hierarchy based on strategic legitimacy

In this type of authority, research teams form an *association of equals*: each team leader directs an autonomous research jurisdiction with regard to scientific strategy and management of research contracts. Contrary to the patronage model, teams no longer acknowledge the scientific authority of the director. However, insofar as the director plays a bridging role with their environments, the team leaders may grant him or her *strategic legitimacy*. Whenever large scientific operations are at stake, they recognize him the capacity to determine the most profitable projects and to filter teams' demands according to their strategic potential. The director has thus legitimacy to support projects that fit best into the policy objectives of PRO and universities and that protect the research unit against drastic financial downturns. However, they abandon their mentor role for team leaders. This function may be taken up by team leaders at the team's level.

Opportunistic relationships

As the director no longer mentors team leaders, the latter do not feel indebted toward him as protégés were towards their patron. On the contrary, their relationships can be described as opportunistic, in the sense that direction and team leaders are not unconditionally bound by mutual aid. Thus, duties of protection (avoidance of competition between teams, protection against outside criticism, mutualisation of all third-party funding, etc.) which prevailed in the patronage type of authority relations have faded. Given that research has become hypercompetitive, directors consider that every team must make do with the available resources and be accountable for its performance. However, there is a common agreement that the director can, in some circumstances, buffer teams' activities from excessive pressures and that there are still, in that sense, limited forms of protection and cooperation at the level of the research unit.

White's example notably shows that *mutual protection* still matters in research units. In 2003

a CNRS visiting committee evaluated White and recommended closing down a team. The position of the director was controversial as he agreed with the committee that the team had failed in its mission to train PhD students and to publish in leading journals. White's researchers could not agree whether the director should have defended the team (or at least stayed neutral) or whether he was right to denounce the teams' poor performance.

In Red's case, the brutal transition from patronage to partnership, or from a "family" to an association of competing teams, generated a general outcry at the beginning of the 2000s. Particularly, the teams could not tolerate the new director telling the visiting committee that some researchers are "*slowing down*" ("*Instead of publicly defending his researchers (…) he completely destroyed them*", researcher at Red). They blamed him with having established a trading relationship with the committee in which he "sold" a team in exchange for the committee's support for his own project.

Furthermore, some forms of *financial cooperation* still have their place even though the relationships may be mostly characterized as opportunistic. Since the 1970s White's director imposed a 5% tax on teams' contracts. He convinced them that there is a collective interest in keeping small budgetary surpluses without one team being a free rider benefiting from another's contracts. Financial cooperation is thus set up on an economic exchange basis (Blau, 1967) whose terms are precisely defined: the debtor teams reimburse their financial debt with the help of their contracts. Green's teams still pool all contracts but mutualisation no longer relies on generosity: every researcher has the duty to seek contractual resources, the "common pot" appearing as a collective insurance against uncertainty.

In the three cases studied, the move to partnership coincided with a generational change, the research units' founders handing the reins to a younger generation of scientists. This new generation no longer acts as "patrons" because the institutional background has become less and less favourable to patronage in the 1990s. Indeed, changes pertaining to career systems, funding and evaluation increasingly conflict with the patronage type of authority relations during the last two decades.

4. Institutional causes of changing authority relations

4. 1. More institutionally managed and competitive career systems

Considering first changes to scientists' careers[4], universities and PROs increasingly use them

[4] At least until the study. New legal rules organizing the recruitment of university academics were enacted in

to implement their science policies. As French universities emerged more and more as strategic actors for research in the 1990s, they increasingly determined position openings in terms of research priorities and not only on the basis of teaching requirements, as was for example common during the first massification wave of higher education in the 1960s. Consequently job announcements generally specify not only an area of teaching, but also a research specialization and the research unit where the research has to be carried out.

As for research staff, they are appointed by PROs. Positions are allocated to the scientific departments each PRO is composed of. There are then further negotiations within departments to decide upon the scientific subfield to recruit researchers (e.g. the department of humanities and social sciences will open two junior positions for sociologists). This procedure furthers the PRO overall policy which aims at developing scientific fields and not at supporting designated research units. This policy also means that vacant positions (e.g. after retirement etc.) go back to the department and then potentially to any of its research units. This scientific policy has been strengthened over recent last decades. For instance, CNRS job announcements since 1990 do not indicate in which research unit the newly recruited researcher will work, so that candidates can select any relevant research unit affiliated to the scientific department. Since the 1990s, there are also a growing number of so-called "signposted" positions which designate the precise subject in which the research has to be performed (e.g.: among the two sociologists, one specialized in industrial relations and the other in gender relations at work). PROs present these "signposted" positions as a way of implementing targeted national research strategies.

Second, informal criteria for recruitment and promotion have been subjected to noticeable changes since the 1990s. The first informal change regarding recruitments and promotions concerns the formalization and toughening of criteria. It is particularly striking in the life-sciences as publications in leading journals and post-doctoral positions have become the norm for getting a junior position (Sabatier, 2008, Robin and Cahuzac, 2003)[5]. Moreover, criticism against academic inbreeding (its presumed effect on clientelism, and on the stagnation of certain scientific fields) has led PROs and universities to counter it through informal rules. At the CNRS, mobility has become an informal requirement for a position as a junior researcher: the percentage of junior researchers who were not recruited in the research unit where they

2007.

[5] The percentage of life-sciences PhD holders in post doctoral positions rose from 20% in the mid-eighties to 32% in the mid-nineties (Robin and Cahuzac, 2003), and finally to 47% in the 2000s (Giret, 2006). Moreover, the percentage of newly recruited *maîtres de conferences* having worked as a post-doc (abroad or in France) went from 43% in 2002 to 60% in 2007 (source: French ministry of Higher Education).

completed their PhD went from 65 to 75% between 2001 and 2004[6]. With regards to university academics, inbreeding has unevenly evolved across universities: some of them – mainly teaching-oriented – mostly recruit their former PhD students, whereas those which are deeply engaged in scientific competition have almost banned inbreeding[7]. Finally, PROs have implemented policies favouring the mobility of junior researchers after their recruitment. For example, the CNRS Life Sciences department introduced "*Thematic Actions and Incentives by Project"* (ATIP or *Action Thématique et Incitative sur Programme*) in 1990 which are "starting grants" for young Principal Investigators who set up in another research unit (the CNRS grants financing of 140.000 euros and a post-doctorate over two years).

4. 2. The rise of project-based funding

The funding of French public research, as well as the form of state involvement, has also hanged considerably over the last three decades. Until the 1980s, science policy was driven in many sectors by the dominant role of the Colbertist state (Mustar and Larédo, 2002) where the state was not only the funder, but also the initiator and the quasi first user of large technological programs. These programs were mainly launched in aeronautics, electronics/computer, space and civil aeronautics, telecommunications and electronuclear. In other scientific fields, research was predominantly funded by long-term core funding from the state and by a limited share of project-based funding. The state's annual subsidies covered at that time general infrastructure as well as the main part of research materials. Moreover, the salaries of permanent staff (who represented up to 80% of the research unit staff, see above) were paid on separate budgets. Since the 1980s there have been significant changes: the large technological programs have either disappeared or become marginal, meaning the near disappearance of the Colbertist state (ibid.). Moreover there has been an increase in project-based funding by the state but also by companies, EU, regional governments, intermediary agencies…

In the life sciences, the share of project-based funding now exceeds that of long-term core funding by the state, as shown in table 5, although these data not include the salaries of permanent staff. The rate of project-funding is still lower in France than in other European countries, although Thèves and colleagues (2007) argue that decisions about the allocation of human resources by French PROs are similar to project-based funding ones as research units

[6] Source: CNRS, Follow up of the recruitment policy of CNRS researchers.

[7] After the law on autonomy, universities have to indicate in their contract with the State a target proportion of external recruitments and promotions. One can then foresee that inbreeding will decrease to a greater extent in the coming years.

compete on the basis of their scientific programs and results.

Table 5 about here

4. 3. Monitoring: a limited "deinstitutionalization" of French research units

Until 2006, mixed research units are evaluated by national peer committees from the PRO they are affiliated to (the very same committees which recruit and promote PRO researchers)[8]. These committees are often located at "the crossroads of the disciplines and of the organization" (Vilkas, 2001) as they both distribute scientific recognition and rewards and implement the PRO science policy. They evaluate the research units after discipline-based peer reviews, reporting on the overall performance of the research unit and also taking into account how the research units' projects fit into the PRO scientific policy. The heads of PROs have repeatedly attempted since the 1980s to "deinstitutionalize" to some extent French research units. These have indeed tended to remain long-lived, longer than their German or English counterparts (Hollingsworth, 2006), and evaluated in terms of their compliance with a few institutional norms, such as meeting global requirements of journal publications, PhD training, research contracts and sometimes relations with the economic world) (Fixari et al., 1993).

A limited process of deinstitutionalization was initiated in the 1990s when PROs started to evaluate each team independently and according to a formalized procedure which made explicit the teams' strengths and weaknesses. For example, the outcome of CNRS teams' evaluations was a letter (from A to E) according to a set of criteria. In the 2000s, this process of deinstitutionalization expanded through an upward trend in the use of bibliometric indicators pertaining to research units as well as individual researchers. The National Research Evaluation Committee noticed a breakthrough in the use of bibliometric analysis in the natural sciences (CNER, 2003), especially in the life-sciences. Even if France is still behind the Anglo-Saxon and Nordic countries, this change has created strong controversies among French life-sciences researchers (French Neuroscience Society, 2006).

4. 4. Consequences for the directors' authority relations over the team leaders

4. 4. 1. From a direct to an indirect and limited influence on careers

Patrons used to "rule the roost", exerting a direct influence on recruitment and promotion

[8] In 2006, the creation of the evaluation agency for research and Higher Education (AERES) modifies the institutional frame which was effective at the time of this study. The AERES is in charge of the evaluation of higher education and research institutions, of research units, and of higher education curricula. It is not entitled to evaluate individuals (PRO researchers or university academics).

procedures. They were indeed part of the scientific elite which had extended powers at the local and national levels, and was thus in a position to negotiate position openings and to directly influence the selection procedures. This is the case at White until the beginning of the 1990s, the director notably holding important responsibilities at the CNRS Scientific Department but also at the university level: "*At that time I was also dean of the teaching department; I was member of the academic council at the university; I was also in charge of a master program for more than 20 years*" (director of White from 1984 to 1996). The same holds true for Green and Red until the beginning of the 2000s. The institutional background facilitated the directors' extended powers over careers. Being a member of the scientific elite is relatively easy when the discipline can still be considered as a "small world" as it was precisely the case for the French life sciences in the 1960s and the 1970s[9].

Moreover, the negotiation of position openings benefited from close interpersonal relationships between the direction of the research unit and the head of the PRO. At that time PROs were still relatively small, their bureaucratic structures were not much developed so that most directors could have a chance to negotiate directly with PRO heads: "*Papon, Feneuil[10], you could still meet them. Then it was no longer possible because the bureaucracy became so heavy"* (director of White from 1984 to 1996). Finally, the high level of institutionalization of PROs and universities enabled directors of research units to defend poorly performing scientists. This seems to have played a role in the research units' early years: "*Would you like to know how Liz got the job? She was rival with a guy who was just brilliant. But she got the position because the head wanted her to join the research unit, everybody knows that*" (senior researcher at White, relating how another senior researcher – Liz – got her first position at the research unit at the end of the 1970s). Other interviews, as well as external accounts on the period going from the 1960s to the 1980s[11], indicate that the last statement should not be disregarded as simply reflecting a settling of scores between colleagues.

As PROs became bureaucratized, and as the number of research units increases dramatically[12],

[9] For instance, the CNRS life-sciences department was only composed of 47 research units in 1966 (31 CNRS research units and 16 mixed research units).

[10] Pierre Papon was the head of the CNRS from 1982 to 1986. Serge Feneuil succeeded him in 1987.

[11] For instance Pierre Tambourin, a prominent life scientist who notably held important positions at CNRS as well as at Inserm, also makes severe judgments on the poor quality of some researchers recruited in the 1970s: "*at that time patrons made it a point of supporting their protégés no matter how good they were. And so we had a lot of people who were promoted without having published a single paper" (*Pierre Tambourin, on the history of Inserm). Downloaded from: http://picardp1.ivry.cnrs.fr/Tambourin2.html, translation Séverine Louvel)

[12] Between 1991 and 2003, 378 research units have been associated to the CNRS life-sciences department (source: CNRS database, data analysis Séverine Louvel). In 2008, the department is composed of 296 research units and of 11510 permanent staff (PRO and universities) (source: CNRS database – Labintel –).

directors began to have only an indirect influence on position openings, which depended on their "lobbying activity" within PRO and universities. Consequently, since the 1990s, the directors of Green, Red and White, emphasise that being member of boards is crucial in order to bring their research programs on top of the university / PRO priorities and in order to get position openings. This lobbying activity is increasingly distributed among a few senior scientists: "*We should really have a full professor from Green sitting on the university boards. This is a quite simple argument; the university would show more consideration. We've had a hard time since Dave (N.B. former director) no longer takes part to these boards*" (Green's former team leader: 1979-2000 and director: 1990-2000). The formalisation of recruitment and promotion criteria and the close monitoring of inbreeding starting at the end of the 1990s[13] also change the directors' role in the application procedures. They may only defend "local" applicants if they prove to have outstanding publication records. However they also have to practice networking to find and attract the best candidates for junior as well as for senior positions. At White some scientists thus ironically describe their director as a "sales and marketing person" who tries to convince any good researcher he gets to know to join the research unit.

4. 4. 2. Sharing their mediating role with other project managers

Patrons exerted strong control over resource allocation, and consequently monitored closely research priorities, which was facilitated when the research unit had most of its funding through State core support and when the patron managed the limited amount of third-party funding. This was the case for Green until the 1990s where the director's role was clearly that of a unique mediator between the research unit and various stakeholders: "*he acted as a go-between with the outside. He was our unique mediation with the outside*." (Senior researcher at Green, speaking about the first director from 1979 to the 1990s). Green's situation is typical of many life-sciences subfields which were long kept at distance from research contractualisation. Red's creation in the mid-1990 is concomitant with the rise of project-based funding in this discipline. By contrast, the autonomy from which White's team leaders benefit from the beginning as project managers, and the early distribution of the mediating role between them and White's direction, reflect the early start of project-based funding in chemistry (White's main discipline along with life-sciences).

[13] Between 1997 and 2003, inbreeding pertains only to 25% of the recruitments and promotions at the local university, which is much below the national average. See also Table 5 for the radical change in the origin of the junior researchers at White and Green.

With project-based funding becoming the sinew of war (Louvel, 2007), the brokerage function became distributed among senior as well as junior researchers. Third-party funding represented between half and two-thirds of White and Green teams' budgets in the 2000s, the remaining part being PRO and universities core funding[14]. Consequently almost all junior and senior researchers manage research contracts. However, the director's role still shows some distinctiveness. As the research unit's official representative, he conducts the institutional negotiations (with PRO, universities, regional governments, etc.) which are from time to time needed to develop the research unit (e.g. building an extension at White in the late 1980s).

4. 4. 3. The decline of their advocacy role

Patrons had no difficulty protecting teams against external evaluations when research units were highly institutionalized. First of all, most evaluations did not put teams in danger as they were considered as formalities, as suggested by the following ironical description: "*the visiting committee arrived by train in the morning, did a walk-through of the research unit, had a nice lunch and chatted with the senior direction and a few senior scientists. Then they went back to the rail station and everyone was happy.*" (Senior researcher at White). Moreover, even if one team was criticized for not having reached an acceptable level of scientific performance, the patrons could easily mitigate this negative appreciation by arguing for the research unit's conformity to broad institutional norms: "*I think John' team who deals with the MNR spectroscopy has always done engineering job more than basic research. But as long as the others teams published it did not matter so much."* (Senior researcher at Green).

The end of the 1990s was a turning point in the three research units with regards to the ability of the directors to protect their teams. Two elements of the limited deinstitutionalization process, namely the evaluation of each team separately, and the introduction of bibliometric criteria, made the directors' protection less significant: indeed he cannot defend a team which does not fulfil the performance criteria fixed by the PRO. At White, the new assessment procedure led notably to the splitting up of one team in the 2000s, what had never occurred since the creation of the research unit in 1966.

The changing authority relations finally have consequences on the kind of scientific strategy research units are more likely to promote. First, the move from patronage to partnership has

[14] Source: Louvel (2007) op. cit. Budgets do not include salaries of permanent staff.

an impact on the conditions for research in the research unit, that is on research priorities, recruitment policy etc. In turn, these distinct conditions for research may have dissimilar – although ambiguous – effects on the scientific outputs of the research unit, its performance and its ability to innovate.

5. Consequences for scientific strategy

5. 1. Conditions for research

Patronage firstly implies that the director limits the team's growth. By doing so, he preserves his scientific legitimacy as well as his mentor function. This restrictive policy relies on several instruments depending on the research unit. In some research units, the director imposes strict limitation on the number of PhD students in each team. He also establishes that scientists should only be recruited among former PhD students and he selects these candidates to academic positions (giving an informal veto to other applications). These rules were in use at Green until the 1990s. Other research units followed more flexible ones insofar as academic inbreeding is not always the rule for recruitments and promotions.

The director may for example decide that recruitments and promotions are done by turns in each team, which is also a way to control their expansion and thus to keep the team leaders under his authority: "*The wish being to maintain an equilibrium between White's teams, we will seek to obtain: in section 28 (team B): the recruitment of X; in section 19 (team C), the recruitment of Y, these two teams currently only have one CNRS researcher*." (Verbal proceedings of White's research unit council from April 27, 1978). Green also turned to this policy in the 1990s: "*The director does what he can so that teams are homogeneous and so that there are no favourites among them, so the recruitments are done in turns in the different teams (...). The downside of this policy is that I was basically told – if you know how to read between the lines – you already had your researcher recruitment for this year and you won't have a second.*" (Senior scientist at Green). Finally, patrons can also restrict the number of "external" senior scientists joining the research unit as they would potentially start a new team and thus challenge the internal balance of power.

Second, patrons keep an overarching view over all research programs. This condition for research is quite crucial for the director to preserve his scientific legitimacy. Here again, directors may implement more or less strict informal rules. Some directors may keep the research programs within a strictly delineated monodisciplinary frame. Following this perspective Green's directors preserve strong scientific coherence until the mid-1990s: "*We launched the research unit to study the interactions between plant cell compartments. So*

we've had a very strong scientific coherence around that until the team working on cytoskeleton arrived (N.B. in 1997). Now the coherence is not so much visible, but it is still there somehow." (Green's former team leader: 1979-2000 and director: 1990-2000). Some researchers are still nostalgic about that time: "*We can't remain a single research unit with that many people. The problem when there are this many groups and different themes, it's that there is not one person at the head who is capable of understanding all the themes (…) Dave and Julia could give interesting and constructive judgments on all the thematics but I think that it's no longer the case.*." (Assistant professor at Green).

In other cases, the director promotes pluridisciplinarity within the research unit but firmly subjects the scientific evolutions to his own strategies and thus leaves little room for evolutions he has not initiated. This is the way White's directors start new themes in the 1980s and in the 1990s: "*Paula played a genuine scientific leadership role, even if it was dictatorial. One can criticize her actions, but at least she proposed themes. In particular it's she who launched material chemistry and microbiology in the mid-1980s*" (Professor at White). The arrival of the team working on cytoskeleton at Green in 1997 also responded to the director's scientific vision.

The move to the partnership type of authority relations implies that the director no longer exerts control over the teams' growth. Team leaders freely decide to hire PhD and postdoctoral students, to have several PhD holders applying for a permanent position, etc. As his authority does not rely on scientific legitimacy, there is also no need for him to gain an overarching view of the research programs. As his strategic legitimacy relies on his ability to support the teams' projects and to help them acquiring funding, the research unit's expansion indicates his achievement. The director thus encourages the teams' growth even if it threatens the scientific coherence of the research unit or if it contravenes the *ex ante* formulation of scientific goals. There are recurrent debates at White about the possibility of designing and following a clear scientific policy, with some senior scientists expressing concern about the lack of such a policy and the director arguing that it would be counterproductive: "*It's so hard to recruit people, you need pragmatism and flexibility. You must not be blocked by a scientific committee by saying that we must recruit in such-and-such team. Decisions must be taken quickly. When a good candidate appears, you have to decide right away*" (White's director, meeting of the research unit council in 2003).

5. 2. Scientific performance and innovation

Patronage can be considered as a double-edged sword in terms of scientific outputs. Indeed, the director may use his far-reaching powers to set up and protect poorly-performing teams. This is the reason why patronage has been highly criticized for being anti meritocratic. The director's control over scientific strategies brings another negative side-effect: it may either point the wrong direction or favour conservatism and mainstream research at the detriment of innovation. For example, some senior scientists argue that their research unit has somehow "missed turning points" because of the director's monopoly on research orientations: for example, new themes were introduced too late (molecular biology at Green in the mid-1990s) or shouldn't have been introduced at all (microbiology at White in the mid-1980s).

On the other hand, patronage is also quite efficient in protecting teams' professional autonomy against hierarchical pressures. In this sense it may preserve a long-term view for scientific research: this happens in the late 1980s when the head of a PRO suddenly decides to deeply restructure the area of plant biology in a sense that would have meant dramatic funding cuts for Green[15]. Clearly, patronage limits here the negative consequences of an authoritarian policy which will be relaxed in the 1990s. The mutualisation of third-party funding also spare researchers fund-raising practices and thus may enable them to engage in innovative research: "*Everyone knows there will always be money to work (…). With program X, the contracts were our main source of funding; it was more than the money given by PRO. That allowed everyone to work*" (Director of Green).

Similarly to the patronage form of authority, partnership has neither obvious nor unique consequences for the research unit's scientific production and its ability to innovate. In fact, one can argue that it furthers meritocracy as it gives room for manoeuvre to every researcher who shows initiative. On the other hand, the opportunistic relations between the director and the teams, as well as the high level of pragmatism with which the director determines the research unit's scientific orientations, have less clear consequences for the research unit's performance. For example White's director took the opportunity to launch a team on "glycobiology" in 1996 while convincing three researchers to join White. This strategy may foster scientific performance and innovation in the long-term: the "glycobiology" team's scientific achievements are unanimously recognized as outstanding; its collaborations with other teams have also advanced knowledge cross-fertilization within White.

On the other hand, as the arrival of the team has stirred up internal competition, some

[15] See Vilkas (2001) for the analysis of the scientific policy of the CNRS Life Sciences Department from 1988 to 1992.

researchers at White consider it as a "*huge wasting of human resources*". Their harsh judgment may partly be explained by the fact that the director's widespread opportunism is conflicting with his mandate to mitigate competitive pressures. However, their diagnosis also accounts for the numerous conflicts arisen after the team's arrival, resulting into the departure of 10 researchers in 8 years, that is to say an exceptional number of exits for French research units[16]. Faced with a similar situation, Red is too small to withstand to a high number of departures: it breaks up in 2003 after nearly half of the researchers leaves to demonstrate their disapproval of the director's policy. Mobility between research units has surely positive consequences on the research system performance. However, such a number of hastened departures put a sudden end to projects and collaborations, and they mean a very bad return on scientific investment for the research unit[17]. One may then argue that these exits do not provide fertile ground for the capitalization and transmission of knowledge in the research unit.

6. Conclusions

This chapter casts light on some intra-organizational consequences of the structural transformations which have affected the French public science system since the 1960s, particularly how authority relations between the directors of research units and their team leaders have shifted from the "patronage" type dominant in the 1960s to the "partnership" type prevailing today. Changes in career systems, funding sources, and assessment procedures have greatly affected director's authority over their research teams: more open and competitive academic labour markets have restricted his direct influence on recruitments and promotions; a gradual increase of third-money funding sets an end to his monopoly over contract management; and the formalization of assessment procedures limits his advocacy role on behalf of his teams. Additionally, while the patronage type of authority implied a limited growth of the research unit and a controlled diversification of research areas, which both enabled patrons to maintain their strong authority and their scientific aura, the partnership form is consistent with the research unit's expansion and with the multiplication of research areas, which both demonstrate the director's ability to defend the teams' interests in a competitive environment.

The authority of directors over their teams seems to have faded along with this transition. One

[16] These exits are all the more striking as there has been almost no exit during the 35 previous years.

[17] In both cases, the research units had acquired costly equipments and appointed technicians to work with the researchers who left the unit.

could here argue that the locus of power in French academia has moved from the professors. The trend here would be comparable to the one observed in Germany where "*professors are challenged from outside by international competitors, and from inside as their mini-cosmology is infiltrated by junior professors*." (Harley et al., 2004; Meier and Schimank in this volume). However our analysis shows that one should not hastily conclude that hierarchical authority has disappeared in French research units. Directors still play a mediating role between their teams and the environments and provide teams strategic resources (work space, equipment, technical personnel, PRO budgets, reputation, networks, etc.). Furthermore, they partly contribute to the teams' ability to bridge and buffer with their environments (Meznar and Nigh, 1995).

The transition observed here can be considered as one of the micro sociological expressions of a broader trend also occurring in other countries such as Switzerland (Benninghof and Braun in this volume), which can be characterized as the evolution of state-coordinated public science systems towards more state-shared ones, and even perhaps moving to a limited form of state-delegated ones (Whitley in this volume). In this type of public science system, research agencies (still in limited number yet in France) and PRO administrative centres restraint the authority of organizational scientific elites (such as the research units' directors). Therefore one should expect that institutional changes subsequent to this study (such as the creation of the national research agency in 2005 – ANR -, of the national agency for the evaluation of research in 2006 – AERES –; as well as the law on university autonomy adopted in 2007 – LRU -), as they might encourage the shift towards a more state-delegated system, will reinforce the partnership type of authority relations.

Finally, our study indicates the limitations of such a global picture by showing that the impact of macro sociological trends varies to a great extent from one research organization to the other. Indeed, the pace of change relies on disciplinary and institutional factors, but also on more idiosyncratic features, such as the generational balance within research units, the director's position among the scientific elite and towards PRO administrators, or his commitment towards certain values and principles.

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Table 1

Number of CNRS research units (managed by the CNRS only) and number of mixed research units since 1992

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CNRS research units	237	222	204	192	198	190	183	161	136	109	108
mixed research units	100	117	134	273	385	522	521	624	743	936	1060

Table 2

Average composition of research units linked to CNRS

	Number	%
University academics	14	29
CNRS researchers	9	18
Researchers from other public research organizations (PRO)	2	4
Other permanent research staff with post graduate degrees	4	8
Other technical personnel	10	20
Doctoral researchers and post-doctoral researchers	10	21
Total	49	100

Source: (Larédo and Mustar, 2001)

Table 3

Details of Research Teams Studied

	WHITE		GREEN		RED	
size and structure	**1966**	**2003**	**1974**	**2003**	**1996**	**2003**
teams	4	5	1	5	1	2
permanent research staff	8	26	3	24	5	13
doctoral and postdoctoral researchers	2	35	-	13	3	6
Technical and administrative staff	-	27	-	12	1	4
Institutional affiliations University PRO	Yes CNRS		Yes CNRS, Inra (National Institute for agronomic research), and CEA (French Atomic Energy Commission)		Yes Inserm (National Institute for Health and Medical Research)	
Scientific field	Macromolecular chemistry and glycobiology		**Plant physiology**		Neurosciences	

Table 4
Recruitments and careers at White and Green (1970-2003)

	Origin of junior researchers		Origin of senior researchers	
	Former PhD students	Other PhD holders	Former junior researchers	Other junior researchers
WHITE				
1970-1990	18	8	4	1
1991-2003	4	20	6	3
GREEN				
1975-1990	5	1	2	0
1991-2003	4	7	3	1

Table 5
Sources of funding in the biosciences

Average sources	All %	France %	Germany %	Italy %	Spain %	Sweden %	UK %
Long-term core funding	25	44	28	18	13	25	27
National funds (project basis)	38	17	47	36	55	35	19
Foundations	16	15	9	25	5	22	35
EU programmes	6	7	6	2	5	5	7
Regional funds	5	4	3	8	10	5	1
Contracts with industry and consultancy	8	12	7	9	8	6	11
Other	2	NS	NS	1	3	2	NS

Source: (Larédo, 2001)