



HAL
open science

A history of the Molecular Biology Department

Benoît Robert

► **To cite this version:**

| Benoît Robert. A history of the Molecular Biology Department. 2014. pasteur-01719506

HAL Id: pasteur-01719506

<https://pasteur.hal.science/pasteur-01719506>

Preprint submitted on 28 Feb 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

Benoît ROBERT: A history of the Molecular Biology Department

1961 – 1968: Genesis

Coincidence of dates may be misleading to the historian. The first reunion of the Molecular Biology Department Council was held on December 12, 1968. With a date so close to the turmoil of May 1968¹, one could imagine that the Department was a revolutionary structure obtained after tough fights by a very demanding young generation.

However, the Department has its roots much beyond 1968, and stems from two initiatives.

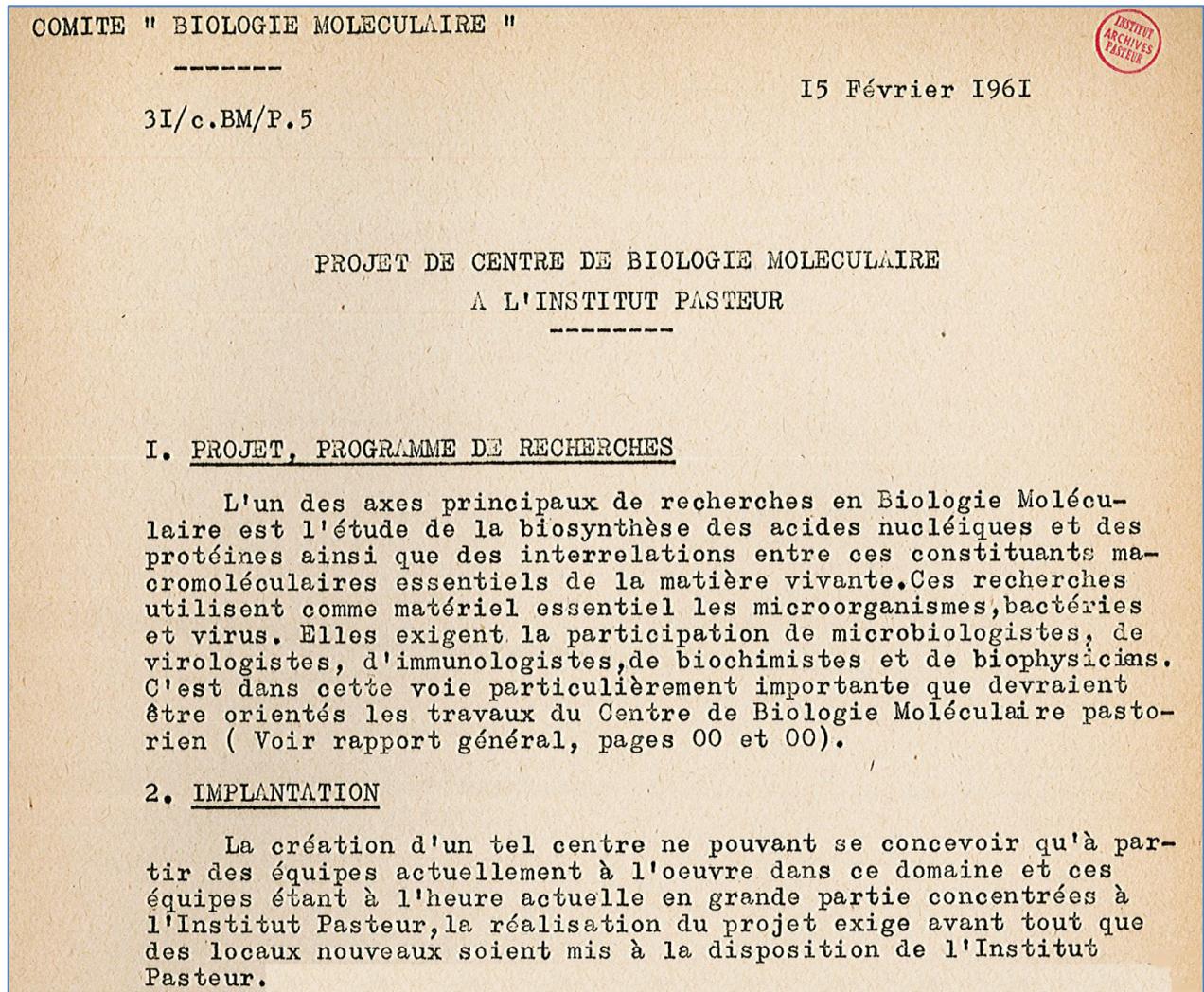
1) As soon as 1961, the very year of the Operon *editio princeps*, Jacques Monod wrote a report for the "Molecular biology" committee of the Delegation for Scientific & Technological Research (DGRST)² emphasizing the necessity to endow molecular biology with an Institute in France entirely devoted to this new biology he had been pioneering and pleading for its construction at the Institut Pasteur. This was supported by the French political staff at its highest level. After Pierre Mendes-France, who organised the Caen Colloquium to elaborate solutions for the organization of scientific research, de Gaulle too tried to raise French science at its highest. One of his first decisions after taking over the presidency of the Republic was to create the DGRST. He is reported to have said, at a reunion that should decide between different options for French scientific research, that “he did not understand any of this molecular biology, but had a feeling that the future lied there”³. And molecular biology won the challenge! Jacques Monod and a number of scientists from Institut Pasteur had been instrumental in the Caen Colloquium, they were highly influential at the DGRST. There were high pressures for decentralisation at the time, so the Institut Pasteur was not the best place for such an Institute. In addition, the Institut Pasteur Board of Directors was very reluctant to

¹ See, e.g., <http://www.ina.fr/video/AFE86001191/la-contestation-la-terrible-semaine-qu-a-vecue-le-quartier-latin-video.html>

² Délégation à la Recherche Scientifique et Technique, an inter-ministerial structure to implement solutions for the development of scientific research.

³ "Pour le conseiller, de Gaulle avait nommé un comité de douze « sages », représentant chacun une discipline scientifique... Latarjet proposa « biologie moléculaire »... De Gaulle prit la parole : « ...je me demande si cette mystérieuse biologie moléculaire, à laquelle je ne comprends rien et ne comprendrai d'ailleurs jamais rien, n'est pas plus prometteuse de développements à moyen terme, imprévisibles, riches, qui feront avancer beaucoup notre compréhension des phénomènes fondamentaux de la vie et de ses désordres et qui peut-être fonderont une médecine nouvelle dont nous n'avons aucune idée aujourd'hui »...” in François Jacob, *La souris, la mouche et l'homme* (Paris: Odile Jacob, 2000) pp. 28-29.

the project. The Board of Directors decreed that "Molecular Biology was of no interest to the Institut Pasteur".⁴



DGRST report: project for a centre of Molecular Biology at the Institut Pasteur, by
Jacques Monod

As a result, another site was elected at *la Halle aux Vins* where Paris University buildings were being erected, such that it was the "Institut de Biologie Moléculaire" which opened first and would become the "Institut Jacques Monod" (initially on the *Halle aux Vins* campus, now at Denis Diderot University).

⁴ André Lwoff, *Jeux et Combats* (Paris: Fayard, 1981) p.88: " il y eut d'abord un échange de vues entre le directeur et le président du conseil d'administration, lequel, notons-le en passant, véhiculait d'illustres chromosomes. La question fut ensuite débattue en conseil d'administration. La décision tomba comme un couperet: « La biologie moléculaire n'intéresse pas l'Institut Pasteur »".

At Pasteur, things slowly evolved. Jacob, Lwoff and Monod were awarded the Nobel Prize in 1965, this certainly contributed to lessen the Board of Directors' resistance, and in 1966, the tone was quite different:

M. le Président et M. Jacquinet font allusion à d'autres projets extra-pastoriens, concernant la Biologie moléculaire, Centre de la Faculté des Sciences, Centre Européen. M. le Président considère que le projet pastorien doit être mis à exécution sans retard. Il permettra d'ailleurs de libérer plusieurs Laboratoires.

1966 Procès Verbaux Conseil Administration 26 février 1966

The project of a Molecular Biology Building was definitely approved on March 16, 1968, and construction shortly ensued. The building would not be finished, however, before the end of 1971.

3°) Biologie Moléculaire.

Monsieur le Directeur, à la demande de Monsieur le Président, expose que le Conseil d'Administration de l'Institut Pasteur a approuvé définitivement, le 16 mars 1968, le projet de construction d'un bâtiment de Biologie Moléculaire pour un montant de 11.050.688 F. (valeur décembre 1967) - non comptés les honoraires d'architecte - fixé après l'adjudication qui avait eu lieu dans les formes réglementaires le 11 janvier 1968. Le bilan financier fut

1969 Procès Verbaux Conseil Administration 21 juin 1969

2) In parallel, within Pasteur, there was a reflection on the reorganisation of scientific activities into departments (according to François Jacob and Moshe Yaniv, it was the initiative of a triumvirate, René Panthier, Bernard Virat and Elie Wollman). The need for such a reorganisation is lapidary synthesized by Elie Wollman in a preliminary report (Novembre 1967) where he analyses its advantages and necessity.

The situation he reports is rather apocalyptic. A reorganization promoted by the Board of Directors in 1934 had led to the constitution of Services, headed by *Chefs de Service*.

However, these had chaotically grown in number, with little of a scientific strategy, sometimes just to satisfy an influential scientist, and as a result there were about 50 Services plus 20 autonomous laboratories in 1967, coexisting without scientific logic whereas services working on similar or complementary topics were dispersed over the campus. From this analysis, Elie Wollman recommends that Departments are instituted and proposes a general frame for the departments that is still functional 50 years later, i.e. in 2017 :

- a department gathers Services or Laboratories working on similar or complementary topics, in a dynamic way, i.e. labs adjustable in size and number.
- labs keep a scientific, administrative and financial autonomy
- a department has specific resources and labs have their own.
- a department comprises a department council that supervises scientific programs within the department, checks the repartition of resources attributed to the Department to the different labs, proposes modifications in the number and composition of labs. The council is made of the PIs in the Department plus elected representatives of the different categories.
- A department is headed by a Director (*chef de département*) who sees that the Department runs smoothly. He is assisted by an administrative officer.
- As much as possible, the department should be located at a single site.

Departments and the Molecular Biology building

As a result, eight departments were created by the Board of Directors in 1967 (see below).

réorganisation en cours - 1967 Rapport annuel Conseil Administration 1967

Sur avis et avec l'appui du Conseil Scientifique de l'Institut Pasteur, il a été décidé que dorénavant l'Institut Pasteur serait organisé en départements de recherche. Compte non tenu des laboratoires de l'Institut du Radium et de Sannois, ces départements seront au nombre de huit :

- 1 - Bactériologie et épidémiologie des infections bactériennes,
- 2 - Virologie et épidémiologie des infections virales,
- 3 - Physiopathologie expérimentale et immunologie médicale,
- 4 - Ecologie des agents pathogènes et de leurs vecteurs,
- 5 - Chimie, physiologie et génétique microbiennes,
- 6 - Immunologie,
- 7 - Biologie moléculaire,
- 8 - Chimie, chimie physique, chimie biologique.

One got structured rapidly, the Department of Molecular Biology, which further had the great advantage of being soon homed in a building of its own.

From then till 2002, the building and the department of Molecular Biology would superimpose.

1968 – 1975: Early times

The projected composition of the Department changed over time, before and after its constitution. It is striking that among the first projects, nearly all were devoted to the Molecular Biology of bacteria and their phages. Except for the notable exception of Jean-Pierre Changeux (yet working on the electrical torpedo electroplaque), there was no mention of eukaryotic organisms. Then, in 1969, Francois Jacob wrote a manifesto in the journal *Atomes* (the ancestor to *La Recherche*) in favour of a Mouse Institute, which would change the fate of the Department.

This had important consequences: when the Molecular Biology building opened, it was associated with an excellent mouse facility, and a young veterinarian and excellent mouse geneticist, Jean-Louis Guénet, had been recruited to take care of it. (Incidentally, the new building was built on an old animal house, where Jacques Oudin would have preferred to have a rabbit facility. Bitter fights between Jacob and Oudin ensued, but Monod decided in favour of mice.)

Another important consequence: this choice left little room for other experimental models of development in the Department⁵.

The Molecular Biology Department in the Monod building

1972 - Composition at opening

6. Biochemistry Unit (F. Gros)	
5l. Physicochemistry of biological macromolecules Unit (H. Buc)	5r. Molecular neurobiology Unit (J-P. Changeux)
4. Cellular genetics Unit (F. Jacob)	

⁵ E.g. in 1986: "après un long travail de prospective, le conseil du Département a souhaité la venue d'une unité supplémentaire travaillant sur la biologie du développement de la drosophile (opération qui n'a pas été retenue)" Department Report, 1986

3l. Cell division Unit (Y. Hirota)	3r. Oncogenic viruses Unit (F. Cuzin)
2. Molecular genetics Unit (D. Perrin)	
1l. Electronic microscopy Unit (A. Ryter)	1r. Immunocytochemistry Unit (S. Avraméas)

(numbers refer to floors, l for left, r for right)

The building was conceived for two major scientists, Jacob and Monod (with full floor labs, 4th and 6th, respectively) and their ex-students or collaborators (half floor labs). By the time the Molecular Biology building was finished, Jacques Monod was nominated Director (1971) and judged that further directing such a big lab would be overwhelming. So he invited François Gros to come back from the Paris-VI University and take his place. François Gros brought with him Moshe Yaniv and Philippe Kourilsky (at this time still working on E. coli and their phages), his technician, Arlette Cohen, and a young Scottish post-doc from Oxford, Margaret Buckingham, to develop the study of muscle cell differentiation together with Daniel Caput.

In 1973, Y. Hirota left after less than one year, which made room for Robert Fauve (previously in F. Jacob's Unit) who had the expertise in immunology Jacob needed. The first floor was filled in with the arrival of Stratis Avrameas, an immunologist bringing with him Michel Bornens and a PhD student, Eric Karsenti – and later on, recruiting another PhD student, Christine Petit. In 1975, David Perrin resigned and his Unit was split between Maxime Schwartz working on similar themes (and keeping same Unit name) and Luiz Pereira da Silva who was coming from F. Jacob's Unit and had started working on *Dictyostelium discoideum*. On the same year, François Cuzin joined the University of Nice, allowing Moshe Yaniv to leave F. Gros' Unit and establish his own, thus maintaining the Oncogenic Virus theme. Then the composition of the Department was stable till 1980, if we disregard the unfortunate episode of the Experimental Cytogenetic Unit (1975-1982, not located in the MB building) directed by Peter Hösli, who was dismissed for scientific misconduct and, from my recollection, had little impact on the department life.

1975

6. Biochemistry Unit (F. Gros)	
5l. Physicochemistry of biological macromolecules Unit (H. Buc)	5r. Molecular neurobiology Unit (J.P. Changeux)

4. Cellular genetics Unit (F. Jacob)	
3l. Cellular immunophysiology Unit (R. Fauve)	3r. Oncogenic viruses Unit (M. Yaniv)
2l. Cellular differentiation Unit (L. Pereira da Silva)	2r. Molecular biology Unit (M. Schwartz)
1l. Electronic microscopy Unit (A. Ryter)	1r. Immunocytochemistry Unit (S. Avraméas)

What was done in the department ? This has been very well described by François Jacob in a report he wrote for the 20th anniversary of the Department⁶.

- Most Units were focusing on the regulation of gene expression.
- Some continued to work on transcription in bacteria (Buc, Hirota then Schwartz, D. Perrin)
- those interested in eukaryotic cells worked mostly on differentiation and development in cell culture (teratocarcinoma – François Jacob, muscle – François Gros)
- A few other worked on various promising models (*Dyctiostelium discoideum*, the synapse and the acetylcholine receptor, oncogenic viruses)

Of note, this thematic diversity, which was not in the spirit of a department as defined by E. Wollman, would remain and even increase in the department till 2002.

Biochemistry was very productive (J.P. Changeux and the acetyl-choline receptor, Bob Whalen in F. Gros' Unit on new isoforms of actins and myosins...), but gene expression during cell differentiation was relying on indirect analyses (in vitro translation of whole cell RNA, RNA-cDNA reassociation kinetics, etc.) and developmental biology was limited to early stages of mouse development compared to teratocarcinoma cell properties. To note a few breakthroughs: the acetylcholine receptor; myosin isoforms; isolation of teratocarcinoma cell lines, study of Polyoma mutant viruses that could grow in teratocarcinoma cells (embryonic cells are notoriously resistant to polyoma virus infection) that would lead to unravelling regulatory sequences in a viral genome.

⁶ "L'intérêt scientifique de la plupart des nouvelles unités était axé sur la régulation de l'expression des gènes, Certaines d'entre elles, comme celles d'Henri Buc ou de Maxime Schwartz, continuaient à étudier la transcription chez les procaryotes, tandis que d'autres, telles que celles de François Jacob ou de François Gros, se lançaient dans l'étude des systèmes eucaryotes, faisant porter leur attention sur les problématiques du développement embryonnaire et de la différenciation cellulaire." F. Jacob, 20th anniversary of the Department

Analysis of gene expression remained very indirect, although with a notable exception: DNA oncogenic viruses provided simple genomes that could be studied as pure DNA species. Thus, Moshe Yaniv's laboratory got important results on the organization of chromatin on a genome and on some properties of DNA regulatory sequences in eukaryotes.

1975- 1980: Great expectations. The difficult quest for tools to study eukaryotic cells and organisms

In these years, there was obviously a great need for new tools. Bacterial molecular biology tools were not applicable to the eukaryotic cell, eukaryotic cell genetics turned out to be rather disappointing, immunochemistry at the time proved prone to misleading interpretations (e.g. F9-antigens and the T-complex – see M. Morange⁷). As Michel Morange puts it mildly, “The first 10 years after Jacob’s change of direction were difficult”⁸.

Obviously genetic engineering would provide the expected solutions. It started well in the department and had strong support from many a PI : considering that the first genetic engineering experiment ever achieved was published at the end of 1973 (Cohen et al., PNAS), Alain Rambach in Hirota’s Unit and Pierre Tiollais in H. Buc's started tackling with phage vectors and restriction enzymes in 1974. However, in July 1974 Paul Berg had published a letter calling for a moratorium on genetic manipulations. This led to the Asilomar conference (February 1975) where the embargo was relieved, but stringent guidelines for the manipulation of genetic material were established.

The "gauchist" tradition in the Molecular Biology department resulted in a very strong resistance to genetic engineering from a few of its members. Some even mustered the press. I can remember "Libération's" title, "*Les enragés de Pasteur*", with a picture of the Molecular Biology building viewed from rue Vigée-Lebrun, overhanging the school and threatening the innocent children, that stigmatized the unconscious scientists who saw only their interests (and those of the industry bosses to whom they pledged allegiance). Furthermore, not all PIs in the Department were convinced that genetic engineering would be a revolution in every domain of biology (cf. F. Jacob's interview ; Ph. Kourilsky interview).

This precluded the Molecular Biology building to be elected as the site for developing gene engineering at Pasteur. In 1975, Jacques Monod (probably primarily sensible to the productive aspect of genetic engineering, according to F. Gros) opened a "Génie génétique"

⁷ in Revue d'histoire des sciences. 2000, Tome 53. pp. 521-554

⁸ in Biogr. Mems Fell. R. Soc. published online February 22, 2017
(<http://dx.doi.org/10.1098/rsbm.2016.0021>)

Unit endowed with a P3 facility in the Duclaux building on the other side of rue du Docteur Roux. This delayed by 4 years the implantation of genetic engineering in the Molecular Biology Department. It was only in October 1979 that a P2 was opened in the lower basement of the Molecular Biology building to perform such genetic manipulations. Science benefits not only from inspired scientists, and I should stress the essential contribution of the department administrative assistant at this time, René Lattès, who was well aware of the needs of the scientists, very diligent and efficient at getting things done. Of note, at the same time, the first computer of the Institut Pasteur (a NOVA 3D from Data GENERAL) was implemented in the Department (facing the P2 in the lower basement) thanks to the efforts of Francis Schaeffer. Francis Schaeffer would then become director of the first Centre for bioinformatics (1981), followed by Jean-Michel Claverie in 1982.

1980 – 1990: The triumph of genetic engineering

Composition of the Department in 1981 and following years (*with dates in italics*)

6l. Biochemistry Unit (F. Gros)	6r. Molecular genetics of development Unit (M. Buckingham) <i>1986</i>
5l. Physicochemistry of biological macromolecules Unit (H. Buc)	5r. Molecular neurobiology Unit (J.P. Changeux)
4l. Molecular biology of Development Unit (JF Nicolas) <i>1988</i>	4r. Cellular genetics Unit (F. Jacob)
3.l. Cellular neurobiology Unit (Henri Korn)	3r. Oncogenic viruses Unit (Moshe Yaniv)
2l. Cellular differentiation Unit (P. Brachet)	2r. Molecular genetics Unit (M. Schwartz)
1l. Electronic microscopy Unit (A. Ryter)	1r. Membrane biology Unit (D. Louvard)

In italics, dates of Unit creation

As soon as the P2 was open and genetic engineering accessible in the department, most Units rapidly indulged into this new activity. It started with Moshe Yaniv (viral genes: Cell, 20, 393-399, June 1980; cellular genes: The EMBO Journal 3, 2505 - 2510, 1984) and Margaret Buckingham (The Journal of Biological Chemistry 256, January 25. 1008-1014, 1981), rapidly followed by François Jacob (Proc. Natl. Acad. Sci. USA 79, 2328-2332, April 1982) and Jean-Pierre Changeux (The EMBO Journal 1, 713-717, 1982).

All of a sudden, projects that had been dreamt of became feasible. It was possible to isolate cDNAs and genes encoding specific proteins, to study their structure, their location on mouse and human chromosomes, their expression during differentiation and even to begin studying the DNA elements regulating this expression. Publishing of original data on these aspects was very intense in the 80's.

Not only the explosion of genetic engineering, but opening of new buildings on the campus deeply changed the physiomy of the Molecular Biology Department. First, the Metchnikoff building opened in 1981 to harbour the Immunology department (departure of S. Avraméas, of Jean-Louis Guénet with Charles Babinet). In the space vacated by Avrameas came Daniel Louvard then a young PI at the EMBL, bringing unprecedented expertise in cell biology (in particular on polarized epithelia) and a new model of differentiation, the intestine. This was the first breach in the endogamous structure of the department. Charles Babinet's departure would result in transgenesis being developed in Metchnikoff, which somehow affected the move towards developmental biology of the Department.

Then, in 1986, the opening of the Fernbach building (Biotechnology department) would attract Jean-Pierre Changeux and Henri Korn over there, leaving space for Mary Weiss, who implemented hepatic cell differentiation, and Bernard Dujon (1987), who was continuing to characterize yeast mitochondrial introns and intron-encoded endonucleases (therefrom I-SceI meganuclease-mediated recombination and Collectis!) but would soon start sequencing the Yeast genome, the first eukaryotic genome extensively sequenced ever. Last, in 1991 the Oncogenic Virus Unit of Moshe Yaniv left for Fernbach, and Philip Avner was invited to create in its place the Mouse molecular Genetics Unit.

Departures, external recruitments and internal reorganizations within the Monod building would bring new blood among the PIs. It was even a will from the Pasteur Direction to favour emergence of new groups led by young leaders (M. Morange, O. Kellermann), a movement that would be amplified in the 90's. Furthermore, not only did the general acceleration of the science momentum brought by genetic engineering (e.g. introns and exons, characterization of oncogenes, the homeobox and the acceptance of Urbilateria – and the whole field of EvoDevo, the redefinition of major phyla, etc..) give a new dynamic to the Department, but new initiatives were taken to strengthen the cohesion of and the scientific interactions in the Department. Moshe Yaniv was very instrumental in this process. He had implemented a regular journal club in the department that had very high standards. In the 80's and 90's, when access to literature was a work in itself, a journal club was a great institution to circulate new

data and discuss new ideas. Walter Gehring, as he reports in his recollection book on the discovery of the homeobox, « remember(s) vividly » that it was at a journal club that he initially heard of Paul Berg's first recombinant viruses and caught the potential of this new technology for his own field, developmental biology⁹.

In 1987, as Moshe was Head of the Department, he substituted an external departmental retreat to the annual "Cultural Revolution" that took place on the Campus. The initiative was modest, people gathered at Garches, a property of Institut Pasteur a few kilometres west of Paris, but considering the resistance of the successive Directions to what was considered a waste of time and money and a betrayal to the other departments on the Campus, this was quite courageous. Then in 1993, Margaret Buckingham would bring the whole Department for its annual meeting to a CNRS vacation centre in the Ile d'Oléron, an initiative that was renewed regularly, and now external annual retreats have become usual for all departments at the Institut Pasteur.

The dynamics that E. Wollman had put forward as a constitutive element of Departments was really at work.

1990 – 2000: Going developmental

Composition of the Department in 1991 and following years

6l. Biochemistry Unit (F. Gros)	6r. Molecular genetics of development Unit (M. Buckingham)
5l. Physicochemistry of biological macromolecules Unit (H. Buc)	5r. Yeast molecular genetics Unit (B. Dujon) 1986
4l. Molecular biology of Development Unit (JF Nicolas)	4r. (P. Brûlet) 1992
3l. Genetics of differentiation Unit (M. Weiss) 1986	3r. Murine molecular genetics Unit (P. Avner)
2l. Cellular differentiation Unit (P. Brachet)	2r. Molecular genetics Unit (M. Schwartz)
1l. Electronic microscopy Unit (A. Ryter)	1r. Membrane biology Unit (D. Louvard)

⁹ W. Gehring, Master Control Genes in Development and Evolution, Yale University Press (1998) pp. 41

There was a logic in the evolution of research from differentiation to development. First, scientist interested in differentiation need to have an integrative view of the cells they are working with, that can be obtained only in developing organisms. Second, it had been the Department ambition to indulge in developmental biology from its opening. This shift was supported by major evolutions from within and outside the department. Outside, the application of genetic engineering to *Drosophila* was unravelling a great number of genes fundamental for development. The pioneering work of C. Nusslein-Vohlard, that was published in 1981, was very timely in this issue. People such as Walter Gehring and David Hogness would turn into molecules what had been phenotypes observed after extensive mutagenesis experiments. Homologs of these were rapidly identified in other animal phyla, resulting in a revival of developmental biology and saving some experimental embryology laboratories from closure (Denis Duboule, personal communication).

Within the department, the ambition to enter developmental biology prompted laboratories to invest into technological innovation, such as in situ hybridization (H. Condamine, 1988; D. Sassoon, 1988) and reverse genetics via homologous recombination in ES cells (Ph. Brûlet, 1992, in F. Jacob laboratory). Meanwhile, C. Babinet developed transgenesis in the Immunology department where he was hosted. From these innovations, a tradition of reverse genetic in the mouse would establish in the department, together with dedicated phenotypic analysis of mutant embryos. At the same time, developmental models began diversifying: in addition to mouse, *Drosophila* was timidly introduced by Roger Ollo who directed a small group on the second floor of Jacques Monod building (1990-1994). Hubert Condamine invested into zebrafish development, and would introduce Philippe Herbomel (then working next door, in J.F. Nicolas' Unit) to this powerful model.

As mentioned previously, from 1995, there was an amplification of recruitments of small groups headed by young leaders that might have threaten the coherence of the department. It led to a kind of patchwork building at the end of the century. Nonetheless, the spirit of the department was preserved (Alain Israel's department report, 1999).

1999

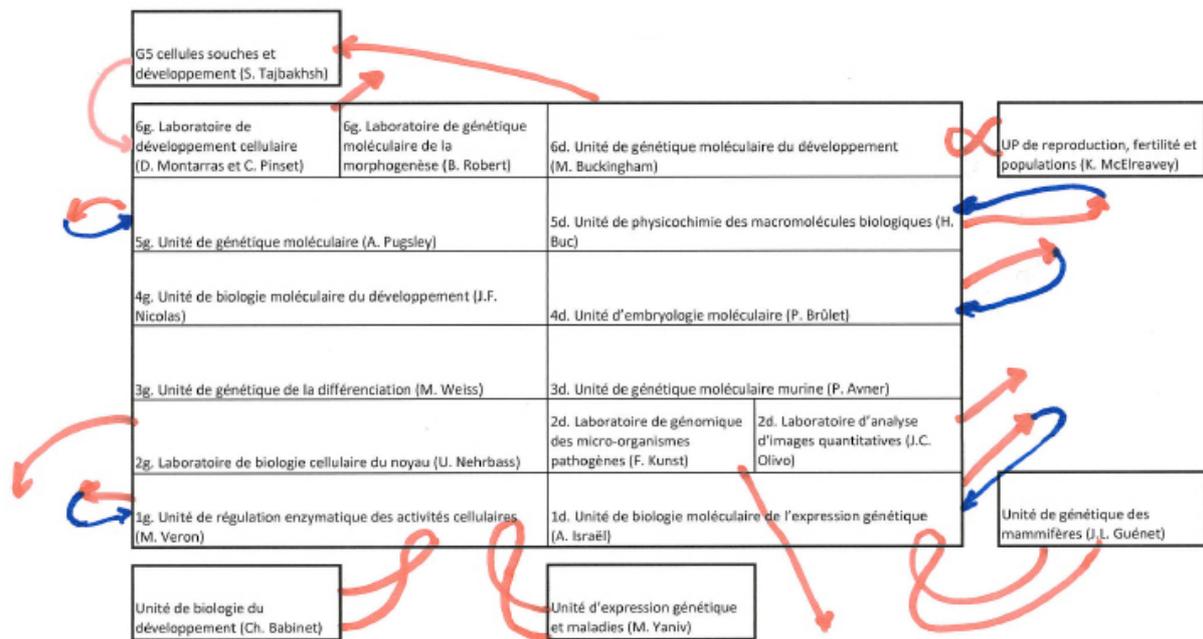
6l. Cellular development Laboratory (D. Montarras & C. Pinset) 1995	6l. Molecular genetics of morphogenesis Laboratory (B. Robert) 1995	6r. Molecular genetics of development Unit (M. Buckingham)
---	---	--

5l. Molecular genetics Unit (A. Pugsley) 1996	5l. Physicochemistry of biological macromolecules Unit (H. Buc)	
4l. Molecular biology of Development Unit (J-F. Nicolas)	4r. Molecular embryology Unit (P. Brûlet)	
3l. Genetics of differentiation Unit (M. Weiss)	3r. Murine molecular genetics Unit (P. Avner)	
2l. Laboratoire de biologie cellulaire du noyau (U. Nehrbass) 1997	2r. Pathogenic micro-organism Genomics Laboratory (F. Kunst) 1997	2r. Quantitative analysis of images Laboratory (J.C. Olivo-Marin) 1997
1l. Enzymatic regulation of cellular activities Unit (M. Veron) 1995	1r. Molecular biology of gene expression Unit (A. Israël) 1992	

2000 – 2010: From "developmental biology" to "stem cell and developmental biology"

When he was nominated President of the Institut Pasteur, Philippe Kourilsky developed his project to give Departments a more important role in the scientific dynamics of the Institut.

The principle of scientific coherence in the definition of a Department prevailed, such that Units belonging to the same Department were dispersed over several buildings, where they cohabited with Units from other Departments, whereas financial gestion remained geographically distributed and was delegated to sites and site councils. This may look erratic at first sight, but with the return of M. Yaniv, J.L. Guenet, C. Babinet, the Molecular Biology Department regained some of its original sociological structure as it was changed into the Developmental Biology department on January 1st, 2002, under the direction of Margaret Buckingham, its first Director. On the longer term, from the play of retirements and recruitments, it has regained a strong scientific coherence together with limited geographical dispersion.



2002: the great upheaval. Red arrows: movements in and out the department; blue arrows: movements in and out the building.

The department as a human community and an administrative structure

What was fundamental to the Department and remains?

It is not without consequence that the Molecular Biology Department was open in 1968. Young scientists in the department (and not so young ones, Jacques Monod to start with) had been highly involved in the May events. One should consider that many of the PIs there had grown up in the war and in the resistance (especially J. Monod and F. Jacob) and they had developed deep reflections on how a society should be organized.

As a result, the bases on which the Department was grounded were marked by the May ideology. The Department would be working on the basis of solidarity, would share resources, would favour scientific interactions. A council would look after the evolution of the department, constituted of the PIs but also of elected members from all the categories of workers. From the beginning, a scientific get-together of 2/3 days every year was instituted, where results from the different Units should be collectively discussed very critically. Not untimely, Agnes Ullman gave these reunions the name of "Révolution culturelle".

The ideological grounding of the Department had its drawbacks. The spirit of May marked the beginning of the Department. For example, a number of the youngsters that joined

the Jacques Monod building would call themselves the Jacobins – for sure because they were François Jacob's students but not without reference to the eponym radical club of the French Revolution. This induced some distrusts: Agnes Ullman, who had experienced the communist dictatorship very closely (she escaped from Hungary in 1960), chose not to join the Jacques Monod building partly to avoid having to comply with "the correct political line" (A. Ullman, personal communication). It also isolated the Department from the rest of the Institut Pasteur.

Very important consequences derived from being a department. There was and still is many collective equipment : ultracentrifuges, scintillation counters, computers, then DNA synthesisers, later q-PCR machines, etc.... This not only allowed to have machines that a single Unit could not have afforded, but as they were in common use, people circulated a lot, thus met a lot and used to know each other – to talk to each other. The overlap between the department and the building had the advantage of keeping together people achieving technical advances with these applying them to scientific questions – actually, they were often the same. This, for me, has been critical for the spread of gene engineering. The experience of this Department should be kept in mind when considering organising scientific research, being lucid however on what is critical in the production of scientific results at a given time.

Acknowledgments

I am deeply indebted to Sandra Legout and Michaël Davy, from the *Centre de ressources en information scientifique* (CeRIS), for giving me access to very precious documents, texts and photographs.

Warm thanks to Agnès Ullmann, Henri Buc, François Gros, Jean-Jacques Panthier, Francis Schaeffer, Moshe Yaniv for sharing with me their memories of the Department. My sincere apologies to the ones I have forgotten to mention.