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Jacques Monod – A theorist in the era of molecular biology / Un théoricien à l'ère de la biologie moléculaire

## Monod as the founder of a new discipline: Local and international contexts



### *Monod, fondateur d'une nouvelle discipline : contextes locaux et internationaux*

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#### ABSTRACT

Monod gained stature as an experimentalist and theorist as well as a discipline builder. The essay reviews the intimate connection of the intellectual and institutional projects in his career. A brief comparison with the development of the new science of molecular biology across the English Channel highlights the commonalities and specificities of the disciplinary projects in France and Britain and the role that individuals like Monod played in their formation. The article argues that there was not a single path that led to the rise of molecular biology. Rather individual initiatives and historical contingencies very much shaped local outcomes.

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#### R É S U M É

Monod est considéré comme un expérimentateur et un théoricien aussi bien que comme l'architecte d'une discipline. Cet essai rend compte des liens intimes, dans sa carrière, entre les projets intellectuels et institutionnels. Une brève comparaison avec le développement outre-Manche de cette jeune science qu'est la biologie moléculaire souligne les points communs et les spécificités des projets disciplinaires en France et en Grande-Bretagne, et le rôle que des individus comme Monod ont joué dans leur formation. Cet article montre que le chemin menant vers l'émergence de la biologie moléculaire n'a pas été unique. Des initiatives individuelles et des contingences historiques ont bien souvent façonné des résultats locaux singuliers.

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## 1. Introduction

In his Nobel lecture, Jacques Monod described the decisive impact his stay as a young researcher at Thomas

Hunt Morgan's laboratory at the California Institute of Technology in 1936 had made on him. It was a "revelation of genetics, at that time practically unknown in France" and a "revelation of what a group of scientists could be like when engaged in creative activity and sharing in a constant exchange of ideas, bold speculations and strong criticism". It was also a "revelation of

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personalities of great stature”<sup>1</sup>. By the time Monod was reflecting back on his formative years, it was amply clear that he had made these revelations very much his own.

Monod gained stature as an experimentalist and theorist as well as a discipline builder. The intellectual and institutional projects were intimately connected. By the 1960s, the Pasteur Institute, where André Lwoff, Monod, François Jacob and others were working, had become a centre for the “new biology” in Europe. While European scientists traveled to American laboratories to complete their formation, a growing stream of American researchers took advantage of the many new fellowship opportunities set in place after the surge in science funding following the Sputnik crisis to spend time in European laboratories. Those interested in the new biology visited the Pasteur Institute or the Laboratory of Molecular Biology in Cambridge – or both. A comparison of the development of the new discipline in these two places will highlight the commonalities and specificities of the intellectual and disciplinary projects in the two centres and the role individuals like Monod played in their formation. There was no obligatory path that led to the rise of molecular biology. Individual initiatives and historical contingencies very much shaped local outcomes.

## 2. Building a new science

Monod joined Lwoff’s laboratory, the Service de physiologie microbienne, at the Pasteur Institute in 1945<sup>2</sup>. Early on, Lwoff and his colleagues were engaged in improving the status and funding of their research in bacterial genetics and biochemistry. Their aim was to achieve better research conditions at the Institute and to change the biological and medical curriculum in French universities, where genetics and biochemistry played only a marginal role. In 1954, a donation from the Rothschild family largely funded the establishment of a Department of Cellular Biochemistry at the Pasteur Institute, of which Monod became the head. Yet this was only a first step.

In 1956, a colloquium organized in Caen by outgoing Prime Minister Pierre Mendès France brought together left-wing scientists, business people and politicians to discuss measures to promote French research. The colloquium was instrumental in forging new links between the participants and in the formation of a science policy in France. As chairman of the committee on fundamental research and university teaching and co-author of the final report Monod played a prominent role in achieving these aims<sup>3</sup>.

The next opportunity for the Pasteurians to promote their institutional plans came a couple of years later, when an American delegation, headed by Democratic Senator Hubert Humphrey, came to Paris to discuss with them the plan of a European Institute of Molecular Biology. The project was to be part of an ambitious “Marshall Plan for Medicine” proposed by the American Senator to “immunize the World from War”. According to the Humphrey’s vision, American funds, funnelled through the National Institutes of Health, would allow scientists from across the iron curtain to cooperate in the field of medical research and provide global health solutions. Such a program would help overcome Cold War divisions and provide the basis for peaceful coexistence<sup>4</sup>. The plan followed on the heels of the Sputnik launch that had raised Cold War tensions and led to a steep rise of government funds for research in the US.

Monod was unable to attend the discussions, but Lwoff, Jacob, François Gros and George Cohen met with the American Senator. The scientists presented the Americans with a memorandum that was signed by Lwoff and apparently was drafted overnight<sup>5</sup>. Yet the proposal was based on long-standing discussions in the group.

The American initiative died before it came to the Senate floor. A European Laboratory of Molecular Biology would not be created before the mid-1970s. The plan was spearheaded by British molecular biologists – an ironic development considering their country’s difficult relationship to Europe. Although Nice was originally considered as a possible site for the new initiative, in the end the European Laboratory (EMBL) was built in Heidelberg [4,8]. Nevertheless, the effort the Pasteurians invested in the American initiative was not lost. Soon the plan for an Institute of Molecular Biology was resumed on a national level in France.

The occasion came in 1960, when President Charles de Gaulle created the Délégation générale à la recherche scientifique et technique (DGRST) as part of an ambitious effort to promote research in France. Molecular biology was designated as an area of special intervention. This was not an obvious choice, but it was made possible by the leading role of the biologists at the Pasteur Institute in the decision-making process and by the convergence of views between them and their political interlocutors that had been forged at the colloquium in Caen. As French historian Jean-Paul Gaudillière has argued, the designation of molecular biology, next to just a handful of other subjects, including oceanography, electronics, cancer research and nutrition, as an area of concerted action was not so much the choice of a discipline as the choice of a group of people that had acquired trust and authority in political and scientific circles [1]<sup>6</sup>. However, not just the Pasteurians were to profit. A first five-year plan foresaw the creation of

<sup>1</sup> J. Monod, From enzymatic adaption to allosteric transformations, Nobel Lecture, December 11, 1965, p. 190; [http://www.nobelprize.org/nobel\\_prizes/medicine/laureates/1965/monod-lecture.pdf](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1965/monod-lecture.pdf), accessed 28 September 2014. [The Nobel Lecture is also reprinted in *Origins*; for quote see p. 297].

<sup>2</sup> For the reconstruction of the development of molecular biology in France, I rely on the work of Jean-Paul Gaudillière [1–3] as well as on the archival material available at the Fonds Monod at the Archives of the Pasteur Institute (AIP). For the development of molecular biology in Britain see [4]. For a comparison of the institutionalization of molecular biology in France, Britain, Germany, and Switzerland, see [5].

<sup>3</sup> On the role of the scientists of the Pasteur Institute in these discussions see [1,6]. On the role of the 1956 colloquium in the formation of science policy in France, see [7].

<sup>4</sup> J.A. Shannon (Department of Health, Education and Welfare) to J. Monod, 14 October, 1958 and H. Humphrey, “Bold ‘Marshall Plan for Medicine’ ” proposed by Senator Humphrey to “immunize world from war”, attached to letter J. Cahn to J. Monod, 1 January, 1959; Fonds Monod, file EIMB, AIP.

<sup>5</sup> A. Lwoff to J. Monod, 20 October, 1958 and “A European Institute for Molecular Biology” [undated, unsigned]; Fonds Monod, file EIMB, AIP.

<sup>6</sup> On the initiative of the DGRST in molecular biology, see also [3].

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