Geneva: Molecular Biology Research Comes of Age

Geneva. The University of Geneva has one of the few notable European centers of research in molecular biology to develop within a university framework. University structure and tradition in Europe have in general been too rigid to accommodate the fast and rather freewheeling development of research in the new biology, and much of the significant work has been done in at least partly autonomous laboratories.

In Geneva, several factors have made the difference: a few Swiss researchers who have fought the good fight, a university and government more responsive than most, and a succession of American postdoctoral fellows and professors on sabbatical who have beaten a path to the door.

There have been times when the fate of the program at Geneva hung in the balance, but now it appears to be firmly established. And there are improved prospects for graduate education, which, as compared to research in molecular biology, has lagged in Geneva as it has elsewhere on the continent.

An Institute of Molecular Biology was established at the University of Geneva in 1962 through the union of a laboratory of biophysics under Edouard Kellenberger and a laboratory of genetic biochemistry headed by Alfred Tissières. Research in molecular biology at the university, however, goes back to the period immediately after World War II. And its evolution has mirrored the growth of the new discipline, with its technology adapted from the physical sciences, its pioneers including many converts from physics and chemistry, and key financing coming from national and international sources.

Kellenberger received his training at the Federal Institute of Technology in Zurich and came to Geneva in 1946 to work with Jean Weigle, then head of the university's physics department and now at California Institute of Technology. Both men were interested in optics and biology, and Kellenberger joined in work to develop an electron microscope for a Swiss firm. About 1950 Kellenberger dropped out of this project and turned to bacteriology, in which he claims he is largely self-educated. Weigle left Geneva shortly afterward, but both men had become interested in genetics. Kellenberger's doctoral thesis in physics in 1953 reflected his interest in both microscopy and biochemistry.

The Americans started coming at about this time and continued to arrive, to work in the laboratory of biophysics started by Kellenberger in the department of physics. Kellenberger received his professorship in 1958. In 1961 he was awarded an NIH research grant for $37,000, which, continued at an annual $22,000 over 5 years, represented a sort of transatlantic seal of approval. Kellenberger is best known for his application of morphological techniques to the study of phage reproduction.

In 1962 Tissières and P. F. Spahr, both Swiss and both working abroad, agreed to come to Geneva to head groups in a laboratory of genetic biochemistry. Work in Tissières' laboratory centers on the general problem of protein biosynthesis. Tissières was trained as a physician in Switzerland but spent the years from 1947 to 1957 at the Cambridge Laboratory of Molecular Biology. Enzymology had been one of his original interests. He received his doctorate at Cambridge and was there, of course, during the exciting days when Crick and Watson produced their revolutionary model. In 1958, Tissières moved to Harvard. There was at the time no place in Switzerland where his kind of biochemistry could be done. Spahr, whose doctorate was in chemistry, wound up at Harvard for much the same reason.

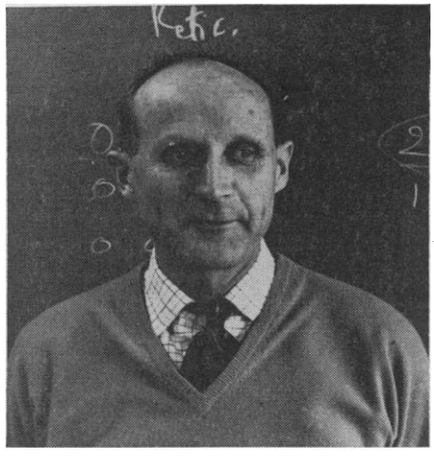
Tissières and Spahr came to Geneva on terms that were very specific. Guarantees about new equipment were given; eventual creation of eight senior posts was agreed to; new buildings were to provide adequate space for research. Formation of an Institute of Molecular Biology indicated that the discipline was securely installed in the university.

There are now five groups, headed by Tissières and Spahr in the biochemistry laboratory and by Kellenberger, Werner Arber, and Richard Epstein in the biophysics laboratory. Arber, one of the four Swiss group leaders, received his degree at the National Technical Institute and joined Kellenberger at Geneva in 1953 as an assistant in microscopy. His doctoral thesis was accepted in 1958; he then went to the United States for a year, spending most of the time at the University of Southern California and visiting other laboratories. One of his main interests is the host-controlled modification of viruses. Epstein is an American. He was at Caltech and came to Geneva as a typical 2-year transient, but stayed. He works mainly on gene expression. The four Swiss group leaders hold professorships, but Epstein's university rank is the more modest *chargé de cours.* At the institute, however, his position is actually on a par with theirs.

There are few complaints about equipment. A million Swiss francs (about $230,000) was spent on instruments in the first 2 or 3 years after Tissières' arrival. Growth of the institute, however, has been inhibited by lack of space. The biochemistry lab occupies space in a modern science block, but the biophysics lab is split between the basement of the physics building and a neat but barracks-like wooden structure which was salvaged from the site of an exhibit at Lausanne and rebuilt in the institute's backyard by members of the lab staff. Plans are being made to construct a new science building designed to house all the university's chemistry-related institutes. The first section of the building should be open by mid-1970, but the new quarters will allow for only limited expansion for molecular biology.

Three of the promised eight senior posts remain to be filled. In part, this is because long-term guaranteed financing for the institute has been disappointing. The delay is important, since the institute's greatest need now is for a larger permanent senior staff.

Building up to "a critical mass" has been facilitated at Geneva by the presence of American scientists. Until recently, at least, American molecular biologists could hope for support to work at reputable European laboratories, and they were attracted to a laboratory with a well-regarded senior staff and good equipment, located in a pleasant city. Since Switzerland itself had no new-breed biochemists, for example, it



A. Tissières

was necessary to build up research by bringing in outsiders. Of ten postdoctoral fellows in Tissières' laboratory, one is German, two are Italians who have been in the United States, and the rest are Americans. The language of convenience in the institute seems to be English.

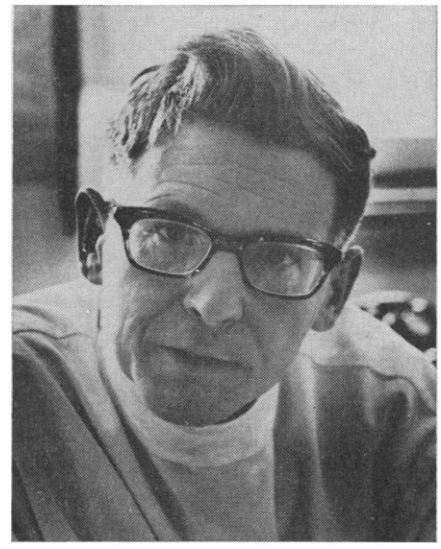
There are drawbacks, however, for the Americans can make only a limited contribution to Swiss biology. They are scientific birds of passage. The postdoctoral fellows stay for a year or two and then depart. The visiting professors often have distracting responsibilities back home. The Americans may not direct thesis work, and they contribute to the education process only incidentally. They have probably made it more difficult for the institute to become integrated with the university.

Now the reduction in U.S. government support of training and research for Americans overseas is taking effect. It is still too early to gauge the impact of the cuts on this particular laboratory. Over the years, the institute has had a number of Americans on fellowships from the Helen Hay Whitney Foundation and from the heart, cancer, and polio foundations. And it happens that most of the postdoctoral fellows in residence or planning to come have support from private foundations. The immediate impact of the cuts is less, therefore, than had been expected. What is happening, however, said one senior staff member, is that substantially fewer letters are coming in from Americans optimistic about receiving support for future work in Geneva.

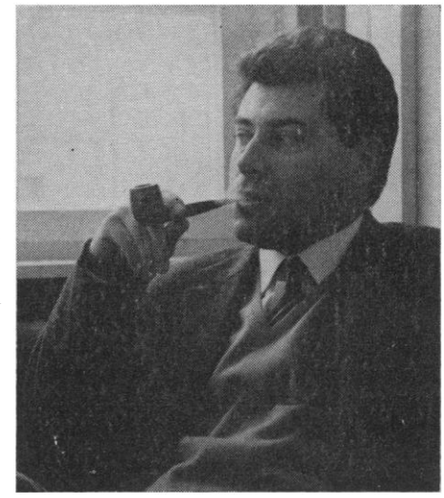
To carry forward its research program the institute must turn out more Swiss molecular biologists. Until recently Geneva was the only real center of graduate work in molecular biology in the country. But relatively few Swiss entered the program, even from the University of Geneva. Swiss universities are strong on classical biology. The enrollment is full. Even at Geneva, where Kellenberger teaches a course in biophysics to students of biology, microbiology and modern biochemistry get scant attention. In general, Swiss students with a first degree in biology seem to have escaped the fever for molecular biology. Most of the institute's Swiss students have come from the Federal Institute of Technology, which mixes a solid polytechnical grounding in physics and chemistry with biology.

To compensate, the institute has created a "certificate in molecular biology." The certificate is designed to attract a small number of able and interested people; it also serves as a test of potential for research. It is open to students with a first degree in chemistry, physics, or biology. Graduates in medicine, interestingly enough, are not thought to have the proper "formation." The minimum time for earning the certificate is 1 year; the maximum, 2 years. The work includes seminars, lectures, and summer courses, but the main thing is a piece of research, which, if promising, may lead to a doctoral thesis.

Graduate education in molecular biology has been becalmed, partly because of a scarcity of jobs in Swiss universities and industry. There are few university posts in molecular biology. The field is a new one, and in European universities new professorships are created sparingly and research funds are increased slowly. A professor's pay at present is not princely in Switzerland—about $10,000 a year—and it is not surprising



E. Kellenberger



P. F. Spahr

that better pay and a bigger research budget have lured many Swiss biologists to the United States. For lower-ranking faculty, terms are even sterner. There is no tenure, American style, for them; pay is low, promotion is uncertain, and the hope of doing independent research is very dim.

The professor is absolute within his laboratory or institute, but in the larger university world he shares power. There is no university administration of the American type. If a new professorship is to be created, or a building constructed, for one faculty, all the faculties—natural sciences, letters, medicine, theology—must approve it. This is Swiss democracy in a university setting, and the arts of bargaining and backscratching have to be practiced.

This is not the whole story. The Swiss National Science Foundation has increased its direct support until it now provides about half the institute's budget of roughly a quarter of a million dollars a year. And university reform is quickening in Switzerland as it is all over Western Europe. Swiss universities depend on their cantons for regulation, and Geneva has been preparing a set of reforms for its university. A chief innovation is expected to be the creation of assistant professorships. They will be for a 3-year term, will be renewable once, and are intended to give the holders some opportunity to do research in order to prove themselves.

Except for the Federal Institute of Technology in Zurich, Swiss university operating budgets have been financed by the cantons. Within the next few months a plan for giving substantial federal funds to the universities is expected to pass the federal parliament. It will require the voting of additional

taxes, but a federal election at the end of last year did not change the parliamentary balance and the legislators apparently favor the measure. Geneva plans to spend the money to increase faculty salaries and create more professorships.

The prospect of change may well have contributed to some developments in Swiss molecular biology in the last year or so. In Zurich a joint research unit in molecular biology has been formed by the university and the technical institute, and in Lausanne a research laboratory is expanding its activities. Signs of a significant reversal of the outward flow of Swiss biologists are seen in the return of such men as Charles Weissmann to Zurich from New York and of Klaus Scherrer to Lausanne from Paris.

In a small country it might seem logical to concentrate resources in a single center. But federalistic feelings penetrate science policy, and the "centers-of-excellence" syndrome is strong. To make the best of dispersion, a Swiss Committee for Molecular Biology was formed to foster cooperation among the units. Advanced-level summer courses in such subjects as microscopy and bacterial genetics are planned, and exchanges and joint seminars between units will be arranged.

Financing molecular biology will remain a problem. The population of the Geneva canton supports the university, and totals 300,000; the population of Switzerland is only 5 million, so public support of basic research cannot be unlimited. Prospects of help from industry are uncertain. A pharmaceutical company in Geneva recently indicated it would probably move unless chemistry research at the university were strengthened, and there are signs that Geneva industrialists (although apparently not yet Geneva bankers) are recognizing the advantages for them of a university with solid programs of research.

Tissières proved several points a couple of years ago when he persuaded four Basle chemical manufacturing firms to give the laboratory no-strings grants totaling about $50,000. The money was used to buy a needed amino acid analyzer, to pay for additions to the library and for travel, and to defray the expenses of scientist visitors. The firms made contributions again this year, although in smaller amounts. In approaching the firms Tissières used very straightforward tactics, supplying the kind of detail given in connection with an NIH or NSF grant in the United States, and describing the needs. There seems to be little tradition of Swiss industry support of basic research in the universities, but that, like other things, could be changing.

What is emerging in Swiss biology resembles the American system. New relationships involving laboratories, universities, and governments are developing, and biologists are cast in new roles. Kellenberger was a founding member of the European Molecular Biology Organization, he serves on the council of the Swiss National Science Foundation, and he is a member of the cooperative interuniversity committee on molecular

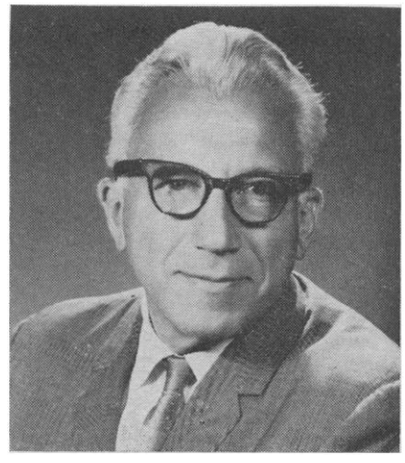
Scientist To Head New York Post

New York Mayor John Lindsay has reached into academic science to fill the directorship of the city's newly established Environmental Protection Administration (EPA). Lindsay's selection for the $35,000-a-year post is Merril Eisenbud, director of New York University's Sterling Forest Laboratory for Environmental Studies, and founding director of the Atomic Energy Commission's Health and Safety Laboratory, which he headed from 1947 to 1959.

The EPA is one of ten cabinet-style agencies that Lindsay has created in a reorganization of the New York City government. The head of each agency will be directly responsible to Lindsay. The EPA will include the departments of sanitation and air pollution control, sewage facilities maintenance, and the water services administration. A noise-abatement unit is also expected to be established within the agency. The EPA will become operational when Lindsay signs an executive order—an action that is expected before 1 March.

Eisenbud was not the sole member of the academic community whom Lindsay attempted to interest in heading one of the new super agencies. James P. Dixon, president of Antioch College, reportedly was offered, and declined, the top position in the New York City Health Services Administration. That position has since been accepted by Bernard Bucove, director of health for the state of Washington.

Eisenbud, who is 52, received a bachelor's degree in electrical engineering from the New York University College of Engineering 1936, and in 1960 he was awarded an honorary Sc.D. by Fairleigh Dickinson University. In addition to working for the AEC and New York University, he has also worked as an industrial hygienist. The New York *Times* quoted Eisenbud as saying he accepted the directorship of the EPA because of the challenges the job offers in "proving that the modern city is governable." Eisenbud has been a member of a number of committees including: the National Commission on Radiation Protection and Measurements, 1965; the National Research Council's Toxicology Commission, 1952–62; the Commission on Meteorological Aspects of the Effects of Atomic Radiation, the National Academy of Sciences–National Research Council, 1956–63; and the World Health Organization's Panel on Radiation Hazards, since 1956. He is chairman of the U.S. Public Health Service's Advisory Committee on Environmental Radiation Exposure and a consultant to the AEC, the U.S. Public Health Service, and the World Health Organization. He is a past president of the Health Physics Society and the author of a textbook, *Environmental Radioactivity*.—K.S.



Merril Eisenbud

biology. All this means less time for research, and this Kellenberger regrets. He stayed in Geneva during the lean years, but after the institute was established he spent some time at the University of Kansas as a visiting professor —his first long stay abroad. Things went well, Kellenberger felt that the institute at Geneva was soundly established, and he was tempted by opportunities in the United States. But he remains in Geneva. Swiss biology has been moving forward. The chance to contribute something to its advance is an attraction. And most Swiss scientists would probably agree that, for them, life in Switzerland has advantages over life in the United States. So, with the roving American scholar likely to be less in evidence and the homecomings of Swiss biologists more frequent, molecular biology in Switzerland seems to have reached, or possibly to have passed, a turning point.—JOHN WALSH

Draft Delinquents: Professors Face Possible Induction

For many young Americans a draft card has no utility except as "proof" of legal drinking age. Officially, the card is merely a reminder of what the draft board knows anyway—that an individual is available for military service.

Nevertheless, draft registrants are required by the Selective Service Act to carry a draft card at all times. Anyone who willfully fails to comply with the act is declared a "delinquent" by his draft board and is subject to reclassification and induction into the military service.

Since November 1967, more than 50 young men have been declared delinquent for having returned their draft cards to Selective Service offices and, subsequently, have been reclassified I-A (immediately available for military service), according to a spokesman for the American Civil Liberties Union (ACLU) in New York City. Among the draft "delinquents" are ten college faculty members and chaplains who surrendered their cards to their respective draft boards in May and October of last year during demonstrations against the war in Vietnam. Seven of the ten have been reclassified I-A, and two have received induction orders.

The ten are James M. Shea, assistant professor of philosophy, George Mason College, University of Virginia; Henry Braun, assistant professor of English, Temple University; David Thorburn and Michael Holahan, assistant professors of English, Yale; Gordon Rogoff, associate professor of drama, Yale; James Matlack, assistant professor of English, Cornell; Reverend Paul Gibbons and Reverend David Connor, associate chaplains at Cornell; Staughton Lynd, assistant professor of history, Chicago State College; and Noel Brann, assistant professor of history, University of Maryland.

Holahan, who turned in his draft card on 20 October at a demonstration in front of the Department of Justice, and Shea, who surrendered his card on 21 May during an anti-war rally in New York City, have both received induction orders. Lynd, Rogoff, and Brann, who turned in their draft cards in October, have been declared delinquent but have not, as yet, been reclassified.

However, Brann, who is a registered conscientious objector, has been ordered to report for civilian work in lieu of induction. The order was issued despite the fact that Brann had asked his local board to return his draft card shortly after he was declared delinquent. According to Brann, "I simply changed my mind on this method of protest." With the request for his draft card, Brann said, he submitted "a strong letter of protest against the war." His draft card was returned, but his delinquency status was upheld.

Colonel Adison Millard, State Director of Selective Service in Nevada, where Brann is registered, said, in an interview with *Science* on 2 February, that "Brann had willfully violated the law," and that "he could not undo the offense by asking for his draft card back."

Although certain local boards have been involved since 1965 in reclassifying war protestors who violate the draft law, reclassification did not become Selective Service policy until last October. At that time General Lewis B. Hershey, National Director of Selective Service, issued a letter to all local boards advising them to reclassify and make available for immediate induction registrants whose speech, conduct, and other protest activities are found to violate Selective Service rules and regulations.

For the ten professors and chaplains who turned in their draft cards, reclassification means the loss of deferments based on occupational and familial status. The seven who have been reclassified are all over 26 years old, the age which has generally been the cutoff point for induction. Henry Braun is 38, three years beyond the maximum age for draftees.

Legal action in behalf of the seven and of several student delinquents has been initiated by ACLU attorneys in federal district courts in New York City; Camden, New Jersey; and Washington, D.C. According to attorney Melvin Wulf, ACLU lawyers have filed suits to restrain Selective Service from taking further "punitive action" against draft delinquents. The suits contend that reclassification and induction is a form of punishment administered without due process of law by an agency not constitutionally empowered to punish anyone.

However, before ACLU attorneys can try the cases they must persuade the courts to overrule an amendment to the Selective Service Act which requires every delinquent to formally refuse induction before being entitled to a trial. The amendment, which calls for the "exhaustion of every administrative remedy" prior to court action, would make it necessary for each delinquent who wishes to challenge his reclassification to commit a second violation—resist induction—before he can be tried for the first.

Even if the courts accept the reclassification cases in their present form, it will be a matter of weeks, perhaps months, before the seven men come to trial. By then, the rapid processing of a wartime draft may have forced all seven to choose between induction and a second violation of the law.

—FRANK CLIFFORD