–20°C at about 2000 atmospheres. Repeated phase transitions produced by pressure changes, combined with strong shear obtained by forcing the frozen bacterial paste through a narrow channel, empties the cells satisfactorily. This technique was then applied to isolation of bacterial cell walls; currently, cell-wall preparations of staphylococcus are of interest as possible antigens for vaccines against antibiotic-resistant strains.

What effect does pressure have on bacteria at a higher temperature? Having begun high-pressure work, members of the group turned their attention to this question. Other workers had reported that high pressure protected enzymes against effects of heat. T. Lindahl found that pressure had a similar beneficial effect on DNA from bacteria (*Bacillus subtilis*); a pressure of 10,000 atmospheres did not denature the DNA, while a pressure of 2700 atmospheres shifted the heat-denaturation curve upward by about 6°C.

More unexpectedly, L. Rutberg discovered that pressure can induce attack on bacteria by latent bacteriophage—an effect normally associated with mutagenic agents. Rutberg confirmed an earlier result that high pressure accelerated the rate of inactivation of *Escherichia coli* B. In the course of these experiments an unknown phage sometimes appeared in the culture. Rutberg was confident that no spurious infection had occurred; he was subsequently able to confirm that pressure indeed activated latent phage. A pressure of only 150 atmospheres sustained for 2 minutes could induce phage activity in some strains of *E. coli*. The mechanism of induction is still obscure; the discovery is of direct technical significance, because ordinary microbiological operations frequently generate substantial pressures and may therefore inadvertently cause phage induction.

Culture of diploid tissue cells (including human diploid cells) is, in Hedén's view, a most promising current development in medical biology. He believes that within a very few years human diploid tissue cells may replace other material, such as monkey kidney, for virus-vaccine production, in view of extraneous effects associated with the use of animal tissue. Human diploid cell cultures should serve many experimental purposes and, as a goal for perhaps a decade hence, Hedén cites the preparation of gamma globulin by culture technique.

Fears about the subsequent appearance of cancer cells in a diploid cell culture have been a brake on the development of this technique. Some individuals are now confident that, if the culture is maintained for not more than a few dozen generations and if a watch is kept for possible neoplastic cells, a diploid culture should be quite acceptable for medical purposes. Technical means of handling the material on a large scale are plainly critical. The principal advance in the Karolinska group has been in the choice of a surface for supporting the diploid cells. O. Molin has shown that titanium discs are very suitable—better than glass; and it is quite easy to provide some thousands of square centimeters of titanium surface in a one-liter bottle. Synchronous growth may be obtained by spinning the titanium discs, washing off newly divided cells which can then be used to start a synchronous culture. In another procedure to achieve partial harvesting, the medium is replaced with a weak solution of trypsin. In this way, a culture could be maintained for a month, with half the population being harvested every 24 to 48 hours.

The invention in 1963 of a technique for preparing films of oriented DNA opened up an important area of research for the bacteriological bioengineering group and for others anxious to study this material. A. Rupprecht developed a wet-spinning method, in which a thread of DNA is continuously stretched during precipitation and then wound on a slowly advancing cylinder so that the molecular strands lie parallel to one another. From the time of the x-ray diffraction work on DNA by M. F. H. Wilkins and his colleagues in London (1951), various means of obtaining oriented DNA have been tried but none provided solid or gelatinous

# IDA Mathematician Dismissed

*Princeton, N.J.* Mathematician James Simons was fired by the Institute for Defense Analyses (IDA) on 29 March because of his refusal to engage in military-related research—a refusal which grew out of his opposition to the Vietnam war. In an interview with *Science*, Simons said that he had been advised of the decision by Richard Leibler, head of the Princeton division of IDA, who told him that his refusal to engage in military work made it impossible for IDA to justify his salary to IDA's sponsor. Simons said he had indicated his willingness to work on IDA's nonmilitary projects.

According to Simons, the decision on dismissal was made by Gordon J. F. MacDonald, IDA's vice president for research, in consultation with General Maxwell Taylor, IDA's president. Simons, a Berkeley Ph.D. who came to Princeton in 1964 after a year at Harvard as an assistant professor of mathematics, said MacDonald had told him at a meeting in Washington on 26 March that Simon's "unwillingness to work on defense material would have to be resolved very quickly."

Simons said that his refusal to work on military matters had been known to IDA officials for the last 6 months. In November of last year Simons had a letter published in the New York *Times* stating his desire for quick withdrawal from Vietnam and saying that, despite IDA president Maxwell Taylor's support for the war, "some of us at that institution have a different view."

Simons said he believed that the IDA leadership regarded him as a "ringleader." And, he said, "there is probably some truth in that. There is no question that I was getting some people here to move away from the philosophy that IDA ought to remain restricted to defense research."

Simons' dismissal will draw further attention to IDA's delicate relationships with its university members. Last month a special Princeton faculty committee recommended that Princeton reconsider its relationship with IDA and renegotiate its arrangements, in conjunction with other university members, so that universities cannot be said to be responsible for IDA's activities. In February a University of Chicago faculty committee said that Chicago should sever its membership in IDA.—THOMAS PLATE