opposition—the low-flying cruise missile and B-1 bomber, which would be harder to track.

- What is the significance of the "Rudakov connection"? Last year, a leading Soviet physicist, L. I. Rudakov, gave a talk on electron beams at four U.S. laboratories and one conference, and suddenly the *American* scientists were not allowed to discuss openly what he said. Speculation on why has run the gamut from warnings of an "Idi Amin bomb" (a nuclear weapon cheap enough to be built by small countries) to the "shopping trip" theory (the idea that Rudakov was telling a little, but wanting to find out a lot in return).
- Assuming the Semipalatinsk facility has anything to do with CPBS, why would the Russians spend so much (reportedly $3 billion) on a project whose applicability as a weapon appears so shaky from the outset? On the strength of this interest alone, some American physicists are trying to get funding to push similar work, which has languished in this country.
- Finally, what is likely to be the effect of this flap on high-energy physics, once the most open and cooperative of fields? That openness might well become the first and only victim of a CPB weapon. □

BOOKS

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. . . NGF

workers. These include a macrophage growth factor, made by fibroblasts (cells present in connective tissue); a fibroblast growth factor, made by the pituitary gland of the brain; and an ovarian growth factor, also made by the pituitary gland. Like NGF, these factors are proteins. However, their amino acid sequences differ from NGF's and from each other's. They also appear to exert different biochemical effects on their target cells. For instance, fibroblast growth factor induces DNA synthesis and cell division in a target cell, reports Denis Gospodarowicz of the Salk Institute for Biological Studies in San Diego. And while Cohen is still not sure how epidermal growth factor exerts its effects, he is sure that it does *not* act on microtubules as NGF does. Thus, "the relationship among these factors, if any, is still unknown," Young concludes.

Finally, should NGF and these other growth factors be classified as hormones, or should they be put in a tissue-enhancing category all their own? Gospodorowicz, who isolated the ovarian growth factor in 1974, reports that "it is distinct from known pituitary hormones." As for NGF, its actions are quite different from those of conventional hormones, Levi-Montalcini has found. And as Angeletti reported in the January BIOCHEMISTRY, the amino acid sequences of NGF from different sources are more similar to each other than they are to the protein hormone insulin, which they resemble to some degree. So are NGF and other growth factors hormones or not? "It's a very hazy area," Cohen concedes.

Meanwhile, more startling insights into NGF keep emerging from labs around the world, and they may well, like pieces of a jigsaw puzzle, finally bring NGF's true value to nerves and other tissues into focus and finally disclose its role in relation to other growth factors and conventional hormones. For instance, Young and his colleagues report in the April and May PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, that NGF is only a partial product of a parent molecule that is 10 times larger than it is, and whose amino acid sequence is grossly different from NGF. As soon as they isolate this compound, researchers may then be in a better position to understand the origin of NGF and what it does for the body. In other words, it may have an even larger role than nerve growth and development.

Also, before NGF's true impact on life is fully appreciated, emerging information about NGF may benefit medicine, and in some unexpected ways. A case in point:

George J. Todaro, Robert N. Fabricant and Joseph E. DeLarco of the U.S. National Cancer Institute reported, in the February PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, that they have found receptors for NGF on cancerous pigment cells taken from several patients who died from malignant melanoma. Such receptors, they add, are not present on fibroblasts, epithelial cells and numerous other cell types. These findings suggest, as some past studies have, that cancer cells, especially melanoma, need NGF for some purpose. But the more provocative aspect of these results is that they might lead to better diagnosis and treatment of malignant melanoma.

In other words, if NGF receptors were found on a sample of pigment cells taken from a person, they might well indicate the presence of malignant melanoma, and possibly in its earliest stages. This sampling for NGF receptors might provide an early diagnosis for this form of cancer. In contrast, an antiserum to NGF or to its receptors might be devised, injected into a malignant melanoma patient and deprive cancer cells in the patient of needed NGF and lead to the cells' demise. Thus such an antiserum might make an effective form of treatment against malignant melanoma. In fact, the NCI researchers have reason to believe that such an antiserum might be even more effective against malignant melanoma after it has invaded the body than before because they have found even more NGF receptors on invasive cells than on noninvasive ones. So the first clinical uses for NGF may well emerge in the cancer arena rather than in the neurobiological one.

Thus, Levi-Montalcini, who watched with wonder the birth of her "miracle" molecule from the womb of malignant tissues, may well live to see NGF and NGF antibodies slay those very same tissues. The world of NGF is indeed baffling, but ripe with promise. □

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