

### Alex B. Novikoff (1913–1987)

Alex Novikoff was a cellular biologist who became a political activist during the 1930s and who joined the Communist Party in 1935 (Holmes, 1989). He was investigated by the House Un-American Activities Committee in 1938, was brought before the Rapp–Coudert Committee in 1941, and the National Institute of Health investigated his loyalty in 1973. An informant identified him as a member of the Communist Party and he was dismissed by the University of Vermont in 1953. In the midst of all this he still managed to publish two papers (Novikoff, 1945a, 1945b) that embodied Marxist principles in the prestigious journal *Science*. Not only that, he received a letter of appreciation for this work from the *American Association for the Advancement of Science*, the journal’s publishers, recognizing his contribution as a significant achievement.

Novikoff’s Marxist principles were framed within the context of what he referred to as the “*concept of levels of integration*.” The concept of levels of integration, he wrote, is a general description of the evolution of matter through successively higher orders of complexity and integration. It describes the progress of the evolution of matter in terms of increasing organizational complexity from the inanimate, to the animate, and, lastly, to social levels of organization. From the opening paragraph he was advocating *realism, materialism* (an implicitly dialectical materialism), and, in the transitions from inanimate to the animate to the social, the *Quantity/Quality Dialectic*. (To be clear, the laws of dialectics were not mentioned as such by Novikoff.)

This evolutionary progression is considered to be continuous because it is a never-ending process of matter combining and recombining at greater levels of complexity. It is also concurrently discontinuous because at each new level of organization qualitatively new phenomena emerge that are not reducible to, nor explicable by, the laws of the lower level. The levels are distinct but not completely delimited from each other. He was thus discussing, implicitly, a *unity of opposites* and the *negation of the negation* in the notion of the evolution of matter as involving both continuity and discontinuity, and he advocated the concepts of *emergence* and *anti-reductionism*.

With regard to emergence and anti-reductionism, each level of integration has properties that are unique to it alone. The properties of both structure and behavior at one level, while unique, are dependent on the properties of the constituent elements—those of the lower level—which make up the higher level. Higher-level phenomena always include phenomena at lower levels. What

were wholes on the lower level become parts on the higher. More than that, knowledge of the laws operating on a lower level are necessary to an appreciation of higher level laws; but these lower-level phenomena cannot be used to predict what those higher-level laws will be. Nor is the higher level reducible to the lower.

Social relationships are at a higher level than the biological, and of greater complexity. In human societies, in particular, qualities are present that render reduction to animal social order inadequate and deficient. Animal societies never rise above the level of the biological. Only human societies operate in accordance with the laws of sociology. Human behavior differs from that of animals due to a different morphological structure, such as the developed brain and hand, and behaviors involving thought, speech, and labor. Unlike animal behavior, human behavior is governed by changing technological forces, and by changing forms of social and cultural relations. In fact, cultural and socioeconomic forces dominate biological factors in directing human action.

Human social behavior is operative at a level that is above that of biological functioning. Relative to sociocultural change, biological change has remained essentially unchanged and what change has occurred resulted from social development rather than causing it. As a result, any reduction of the social to the biological would be greatly amiss. Novikoff's whole treatment of the social is clearly consistent with *historical materialism* (the Marxist theory of social-historical development).

Many Marxist principles were presented by Novikoff in his paper on levels. Not only were these principles not spotted, the paper was hailed as an important achievement. All this was in spite of the close scrutiny he was under as a suspected communist. It is an interesting example of how personal prejudices, especially uninformed prejudices, in this case against Marxism, can lead to rejection without understanding. Novikoff's papers on integration were chock full of Marxist principles but, since no mention was made of Marx, they were given a fair hearing and found to be of considerable scientific merit.

## References

Holmes, D. R. (1989). *Stalking the academic communist: Intellectual freedom and the firing of Alex Novikoff*. Hanover, NH: University Press of New England.

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Novikoff, A. (1945b). Continuity and discontinuity in evolution. *Science*, *102*, 405–406.