

Materials Science and Technology Division  
Materials Theory Group

**“Theory of Radiation Damage in Solids:  
From Oversimplified to Predictive General  
Framework”**

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**Abstract**

Efforts of many scientists for more than a half of a century have resulted in substantial understanding of the response of various materials to irradiation. The contribution of theory to this process is significant. Consequently, some phenomena have been predicted before their observation: void swelling, radiation-induced segregation and existence of one-dimensional mass transport under high-energy cascade-producing particle bombardment. Development of the NRT standard for a common measure of the irradiation dose, the Standard Rate Theory and its further development, the BEK model, during 70<sup>th</sup>-80<sup>th</sup> of last century, have established a framework for analyzing microstructure evolution in different materials. At the beginning of 90<sup>th</sup> the so-called ‘Production Bias Model’ (PBM) was proposed, which gave qualitatively new insight on the microstructure evolution in solid under neutron irradiation. It took about 20 years for the model to be evolved to a fully self-consistent theoretical framework. In the present talk, a brief history of the RD theory and its current state will be presented together with its applications to reactor structure materials.

Host: G. Malcolm Stocks and Roger Stoller