

Numerical Modeling at L'Oréal R&I: Present and Future

Bernard Querleux Ph.D., Hab.

L'Oréal Research & Innovation
Aulnay-sous-Bois, FRANCE
BQUERLEUX@rd.loreal.com

This talk will focus on some topics and challenges which are specific to the cosmetic science in general, and will be illustrated with some of L'Oréal results.

Cosmetic research is characterized by a diversity of topics and needs specialists in over thirty disciplines (chemistry, biology, physics, optics, dermatology, toxicology, genetics, etc.) who attempt to push back the limits of knowledge about hair and skin. They are deepening our intimate understanding at a cellular level and lower, highlighting the biological mechanisms at work in aging, natural color, graying or hair loss, they are synthesizing molecules that act, protect, repair or color, and designing, developing and testing products suited to all types of skin and hair.

For L'Oréal, at the crossroads of several domains, numerical modeling is fast becoming a key factor in the success of its missions:

- *Discovering* new avenues of innovation
- *Predicting* in the field of safety assessment
- *Simulating* to anticipate visible performance

I will present some modeling results at different spatial scales from the atomistic level (molecular modeling) to the macroscopic level (Physically-based model of hair movement), and I will address some challenges requiring a multiscale modeling approach.

Faced with the need to calculate before designing, multiscale modeling will enable L'Oréal and all other cosmetic companies to process all the interactions between *active ingredients*, *formulas* and *cosmetic substrates* within the same time frame.