**Doctorate Honoris Causa to Dr. James P. (Hamish) Kimmins**

**Université du Québec à Montréal (UQAM)**

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*Cher collègues et etudients, Mademoiselles et Monsieurs*

*Cette nomination est pour moi un tres grand honeur. C'est une reconnaissance de l'importance de l'ecologie forestier, et de les contributions de plusiers ecologistes envirs la conservation, la durabilite et l'intendance des forets. Je dedie cet honeur a eux tous.*

*Je regrette la peu de connaisance que je possede du Francais. Avec votre permission, je continuerai en Anglais*.

What have I learned from nearly 50 years as a forest ecologist?

- That forest ecosystems are more complex, diverse and dynamic than most people think
- That education, science, forest policy and practice, and the environmental movement have generally not addressed this complexity and diversity adequately.
- That unless we replace poorly informed belief systems and policies about forests with a science-based understanding of these complex ecosystems and their dynamic changes over time, we will fail to honor our intergenerational ethical obligations to pass on to future generations the forest ecosystems and their conditions that we believe our descendants will need and desire.

Science has three main components: knowing, understanding and predicting:

- *Knowing* involves experience and descriptions of the past and present, including "traditional knowledge". This provides an excellent basis for prediction, forest policy and management ***IF*** the future will be the same or very similar to the past. It is not a reliable foundation for stewardship and sustainability under changing environmental, management and social conditions. The empiricism involved is the most believable component of science, but it is of the past and present, and not of the future that we must consider if we are to make ethical environmental and management decisions.
- *Understanding* involves investigation and quantification of the individual components and processes of ecosystems, or the sub-system of interest. Conventional scientific methodology is poorly suited to addressing the complexity of real ecosystems, so understanding necessarily involves reductionism and disciplinary investigations – study of the individual pieces of the ecosystem "jigsaw puzzle". This is an essential activity by which to test new ideas and to reject erroneous hypotheses about individual ecosystem components and processes. It provides the necessary building blocks for prediction about real ecosystems. It is the appropriate focus for many or even most scientists, but on its own it is insufficient.
- *Prediction* involves the synthesis of experience and understanding up to the level of complexity and the time and spatial scales of real forest ecosystems and management issues.

Disciplinary science that leads to understanding is like cutting up a picture of an ecosystem and examining the individual pieces and their interactions. However, to understand the overall picture it is necessary to re-assemble all the pieces. And even such re-assembly is not enough. Life is never static. It is continually evolving and changing; both managed and unmanaged forest ecosystems are continually changing in structure, composition and function under the influence of internal biotic processes and external abiotic and biotic disturbance factors. To understand the dynamic nature of forest ecosystems and their values and environmental services, pictures of the range of possible future states of the forest at various times in the future must be assembled into "movies" of possible forest futures. These should become the basis for evaluation of stewardship and sustainability. To produce such "movies" we need to use multi-value, ecosystem- level forest simulators with which to examine alternative scenarios and value tradeoffs.

Most of the science graduates from educational institutions should be creators of understanding and/or add to our body of knowing. But an increasing proportion should be ecosystem-level "movie makers". Training such movie makers has been the focus of my research and educational efforts over the past 40 years, in addition to those of my students who focused on knowing and understanding.

Albert Einstein said: "Theories should be as simple as possible but not simpler". This reflects the belief of William of Occam (1288-1348) that "theories and explanations should be as simple as possible but as complex as necessary". Unfortunately Science has generally focused on the first half of this assertion – through the Principle of Parsimony. Honoring the conclusions of both Einstein and Occam, we should use models for prediction about forest ecosystems that are as simple as possible but as complex as necessary to give us the most reliable predictions possible. Sometimes simple models are quite adequate, but frequently they are not, especially when considering the management of forest ecosystems.

It is my hope that those of the graduating class of the Faculty of Science who decide to examine the pieces and individual processes of ecosystems in their future careers will do so in a manner that facilitates the development and use of models of appropriate complexity

It is my hope that those who chose to become "movie makers" will always remember that models are necessarily a simplification of reality and always imperfect, but nevertheless useful.

There is amongst many scientists, much of the public and many environmental organizations a tendency to have a mainly biocentic focus rather than an ecosystem-centric focus. There is a growing tendency to interpret ecosystem characteristics in terms of a "supra-organism", as though the ecosystem is closely analogous to a living organism that can be "born", can "die", can become "sick", will "die" if certain components are temporarily removed by natural or human-caused disturbances. Such a biocentic focus has its merits but cannot on its own provide a reliable basis for ethical stewardship. Only an ecosystem-level view linked to analysis of social systems can provide that. I challenge all to consistently think of the object of their scientific interest in the context and complexity of real ecosystems.

*Dr. Hamish Kimmins*