Computerised Modelling for Developmental Biology

Bertens, L.M.F.

STELLINGEN

behorende bij het proefschrift
"Computerised modelling for developmental biology – an exploration with case studies"

1. The *cavum pulmonale*, found in non-crocodilian reptiles, is functionally part of the adult ventricle, but is developmentally derived from the outflow tract, presenting a pattern of heart development thus far not described for any vertebrate (this thesis).

2. Evolution does not take place via non-adaptive intermediate steps, but can only occur through adaptive changes; the turtle heart, therefore, does not represent a mere transitional stage in the evolutionary development towards completely separated ventricles, but rather a functional adaptation to particular environmental conditions (this thesis).

3. By incorporating parameters from differential equation models in Petri nets, developmental processes, such as gradient formation, can be modelled in a way that combines modelling strengths from differential equation models (quantitative analysis) and Petri nets (qualitative understanding of the process) (this thesis).

4. Modelling biological knowledge using ontologies stands to gain from a *divide et impera* approach; by dividing data over a set of ontologies and linking these in an ontology system, the separate ontologies can serve a wider range of purposes than the system as a whole, as is exemplified by the ontology of developmental stages (this thesis).

5. A biologist's understanding of a process (often descriptive and qualitative) is frequently at odds with an informatician's approach to modelling a process (often exact and quantitative); in order to facilitate communication, modelling approaches are needed which integrate these viewpoints.

6. Many modelling techniques, designed for a specific purpose or field of research, can successfully be applied to other fields; when looking for a new modelling approach, it is therefore often worthwhile to investigate already existing techniques within a new context.

7. Focus in biological research has shifted towards molecular and genetic studies; however, current debates on taxonomy still stand to gain from descriptive studies of developmental anatomy and morphology.

8. In the current era of scientific specialisation, interdisciplinary research is important in order to prevent isolation of research fields and to retain an understanding of the underlying connections between all areas of study.

9. Knowledge of Classical antiquity helps understand most aspects of Western civilisation, including language, politics, art and science.

10. “If you want a golden rule that will fit everybody, this is it: Have nothing in your houses that you do not know to be useful, or believe to be beautiful” (adopted from William Morris, ‘The Beauty of Life’, lecture before the Birmingham Society of Arts and School of Design, 19 February 1880).

11. With some perseverance, a jack of all trades can be a master of several.