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Scientific Knowledge Creation Supported by Data Integration and Information Fusion

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What is scientific knowledge? We create some hypothesis based on theories, develop models, and implement experimental observation for validation of the hypothesis. This approach is called deductive inference. Based on the accumulation of factual knowledge, we can form the hypothesis. This approach is called inductive inference. Scientific knowledge is called formal knowledge which can be transferred and shared among wide scientific communities. By publishing paper and promoting communication, we exchange the factual knowledge. Such widely shared factual knowledge is defined as scientific knowledge. We are doing science in this way. During past one hundred years, this scientific knowledge has been increasing explosively. Differentiation and systematization have proceeded, and then a large number of disciplines have been established.

However, it is very difficult to reflect accumulated sub-system knowledge to holistic knowledge. Knowledge on a whole system can be rarely introduced to a targeted subsystem. In many cases, knowledge in one discipline is inapplicable to others. We are far from solution of issues across disciplines. It is critically important to establish inter-disciplinarity and create scientific knowledge crossing disciplines. To realize the benefits of scientific knowledge in society, we need to combine scientific knowledge in the natural world, the socio-economic world and the recognition world and to develop trans-disciplinarity as well as inter-disciplinarity.

How can we develop inter-disciplinarity and trans-disciplinarity? We need to share the data and information and develop inter-linkage of our knowledge by developing models and exchanging tools. Based on this kind of scientific activities, we can corporate between science community and society by making effective use of opportunities.

Data Integration and Analysis System (DIAS) coordinates the cutting-edge information science and technology and the various research fields addressing the earth environment, constructs data infrastructure that can integrate earth observation data, numerical model outputs, and socio-economic data effectively, creates knowledge enabling us to solve the earth environment problems, and generates socio-economic benefits, aiming to create knowledge to be shared among different disciplines, to create knowledge to be shared throughout the world, and to disseminate data and information that brings awareness.

Keywords: Data Integration, inter-disciplinarity, trans-disciplinarity