e-Human Ecology

A New Direction in

Erasmus Computing Grid

Cyberspace and Virtual Societies

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The Challenge of e-Life and a-Life

The advances in information technology are not only the basis of modern life but also lead to cyberspace and virtual societies with entirely new aspects of then called e-Life, which is in principle a subspecies of artificial life in general.

E-Life and a-Life are characterized by fundamentally different properties compared to the classical biological life and the emergence of society and culture thereof!

The Principle of b-Life:

⇒ b-Life is locked by the background of biological evolution and cannot exceed its inherent time scales, laws and systems!

=> shifts without violating the basic law of nature to =>

:The Principle of e-Life and a-Life

e-Life and a-Life can leave the background of their evolution and can exceed their inherent <= time scales, laws and systems !!!!!

The e-Life and a-Life challenge lies in the new of human ecology rectangle phenomena:

- **Micro-Phenomena: the new internal properties with their new time scales, laws and systems.**
- **Macro-Phenomena: the intirely new e-Social and a-Social phenomena evolving from the micro phenomena.**

The Erasmus Computing Grid

The largest desktop grid for the biomedical research and care sectors with now ~10 Tera FLOPS and a potential ~30 Tera FLOPS and ~15,000 desktops, at two city wide institutions: the Hogeschool Rotterdam and the Erasmus Medical Center.

Research:

- genomic and proteomic analysis
- epidemiology
- image analysis, e.g. Applied Molecular Imaging (AMI)

Education:

- training of the coming grid generation of IT specialists
- developing new concepts for grid computing

Diagnostics:

- clinical image and data analysis
- operation planning and operation support

Industry:

- brokerage of computing resources

Dedicated and Secured!

MediGRID and Services@MediGRID

MediGRID and Services@MediGRID operate the national biomedial research and care cluster-grid within the national German D-Grid initiative and integrate various disciplines, institutions, and states throughout Germany.

Erasmus Computing Grid

Erasmus MC

HOGESCHOOL ROTTERDAM

~ 20 BioMedical User Groups

Distributed - Office

~ 20 D-Grid Communities

~ 100 D-Grid Donor Organizations (~10 MediGRID)

~10,000 Cluster Nodes

~ 2,000 Medical Secured

Module Coordination:
- coordination of the distributed office

Module Resource Integration:
- sharing of the integrated resources

Module Middleware:
- grid technical virtualization

Module Ontology Tools:
- ontology development for grid user projects

Module BioMedical Informatics:
- user projects in biomedical research

Module Clinical Imaging:
- user projects in clinical imaging

Module Clinical Research:
- user projects in general clinical research

Module e-Science:
- general research on e-grid science

Services@MediGRID:
- services towards MediGRID

Dedicated and Secured!

Large-Scale Resource Sharing in IT:

The *Inverse* Tragedy of the Commons

The grid phenomenon and its implications are similar complicated to the ecology/climate/environmental challenge!

The Tragedy of the Commons:

=> A resource belonging to all and being on limited demand is overexploited / destroyed by the users due to responsibility diffusion!

<= transforms into =>

:The *Inverse* Tragedy of the Commons

A Resource belonging to all and being in affluent availability on limited demand is <= *underexploited* by potential users due to responsibility diffusion !!!!!

Similarity: Renewable Energy Resource!

The grid challenge lies in the e-Social embedding of grid phenomenons:

- **Micro-Social: the sharing attitude and socialization of the individual.**
- **Macro-Social: the organization culture of the embedding institution.**

Autopoietic Social Sub-Systems:

The Grid Challenge of Integration

The social systems theory by Niklas Luhmann (1927-1998) based on the autopoietic concept of Humberto Maturana and Francisco Varela (1946-2001) is so far the most advanced social systems theory existing to describe the complexity of grid implementation.

The Social Sub-Systems Involved:

- **Religion**
- **Education**
- **Science**
- **Art**
- **Economy**
- **Jurisdiction**
- **Policy**

=> currently grid involves only considerably => SCIENCE

:The Autopeitic Tragedy of Social Sub-Systems

The subsystems have their own code of communication and are separated from each other in a way blocking in principle a consistent integration although they form a society with all their contradictions !!!!!

The e-Social challenge lies in the integration of sub-systems towards a working grid society:

- **Micro-Sub-Systems: the sub-system stickiness of individuals.**
- **Macro-Sub-Systems: the integration of institutionalized sub-systems via soft interfaces.**

Grid Psychology

From Individual to Cultural Risk Management

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Grid implementation and social spread is carried first by individuals as with any meme introduced into society: in the focus of the transformation of society to e-Society stands - as always - the balance between potential risk and opportunity.

linking grid psychology with autopoietic social sub-systems

The Risk Psycholgy Matrix:

- **Individual Security Perception & Risk Acceptance**
- **Knowledge-Based Security & Risk Acceptance**
- **Incidental Security Reaction Behaviour**
- **Legal and Political Security Scenarios**
- **Religious & Cultural Security Archetypi**

:The Autopoietic Link

- **Genetics & Deep Psychology (C.G. Jung)**
- **Education & Science**
- **Economics & Realities**
- **Jurisdiction & Politics**
- **Religion, Art & Culture**

The grid challenge lies in a unified concept addressing the psychology of grid:

- **Micro-Risk-Management: the micro-risk in the perception the individual and its emotional well-being.**
- **Macro-Risk-Management: the macro-risks in the procedural and institutionalization in organizations.**

e-Human *"Grid"* Ecology

Overcoming of the "Dare-To-Share" Attitude

The success of grid is based on a sustainable grid ecology within the e-Society, i.e. the e-Human Ecology of Grid reaches a equilibrated space within the integration of grid psychology with autopoietic e-Social sub-systems. Human Ecology first evolved in Chicago in the 1920's in the area of city development by Robert Park (1864-1944) and Ernest Burgess (1886-1966).

The Definition of e-Human "Grid" Ecology:

"Under e-Human "Grid" Ecology we understand the complete science of the relationships of grid to the surrounding environment to which we can count all conditions of existence in the widest sense."[1]

[1] Haeckel, E., Generelle Morphology der Organismen, Berlin, Band 2, Allgemeine Entwicklungsgeschichte, p. 286, 1866.

[2] Haeckel, E., Natürliche Schöpfungsgeschichte, 9. Auflage, Berlin, p. 793, 1898

(e-Human "Grid" Ecology "is) …the relationship between grid and all other e-Social systems." [2]

⇒ Solution to the Inverse Tragedy of the Commons!

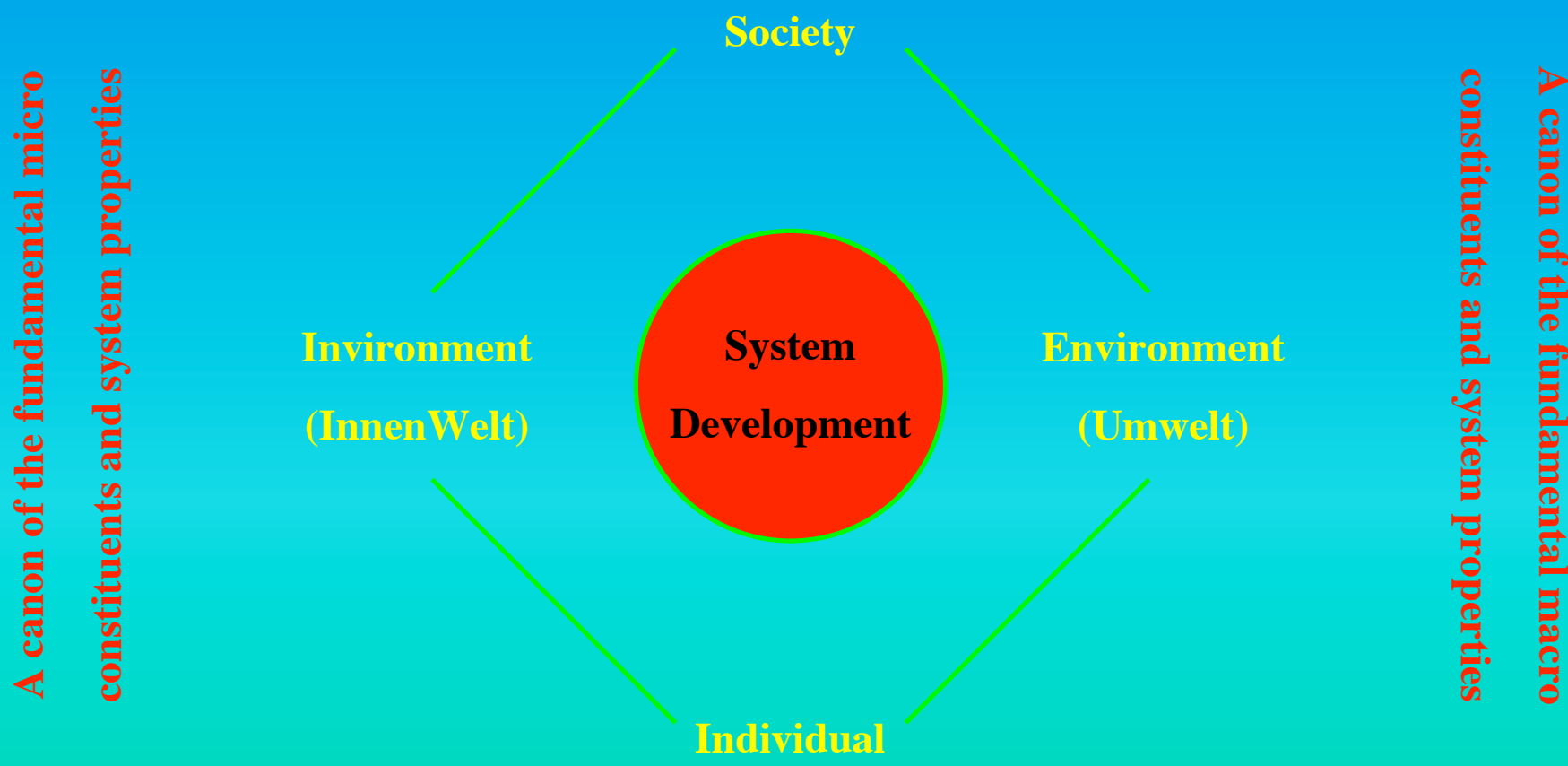
The solutions of the grid challenge on the operational layer are addressed by:

- **Micro-Operationality: the participative integration of fundamental IT applications of major individual users complying with the psychology of grid in an e-Human Ecology manner.**
- **Macro-Operationality: the set-up of an open and sustainable management structure complying to all the autopoietic e-Social sub-systems in an e-Human Ecology manner.**

The Curriculum of e-Human Ecology

Curricula of the canon and grammar of e-Human Ecology need to contain the further developed classic contents of the human ecology rectangle as well as the knowledge and understanding of the special aspects of e-Life and a-Life.

The classic human ecology triangle is transformed into the *human ecology rectangle*, to complete the circle for creation and dependencies for a curriculum canon and grammar!



The Happy End - Profits Sharing the Commons

Both the Erasmus Computing Grid and the MediGRID/Services@MediGRID examples show that the IT challenges mankind faces in the biomedical research and care sectors can be successfully approached by exploitation of the commons by e-Human "grid" Ecology means.

Erasmus Computing Grid

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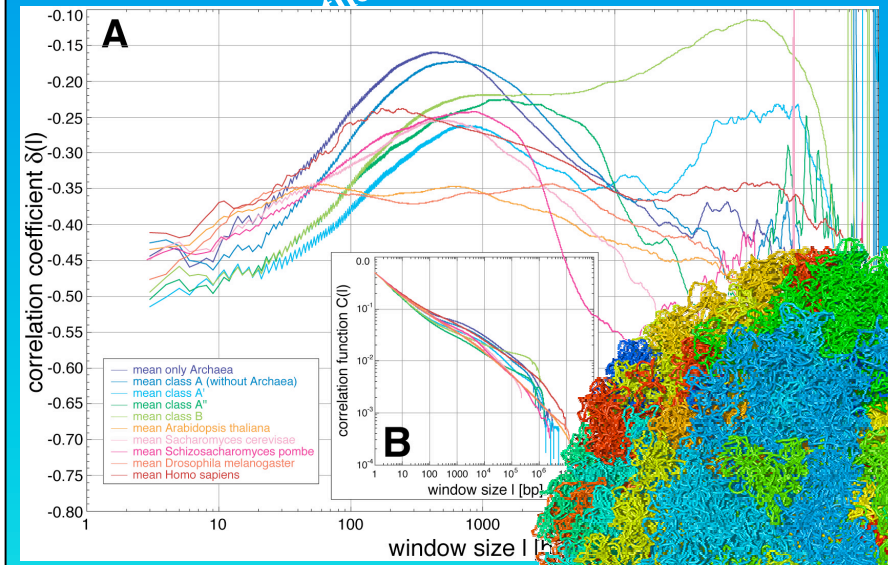

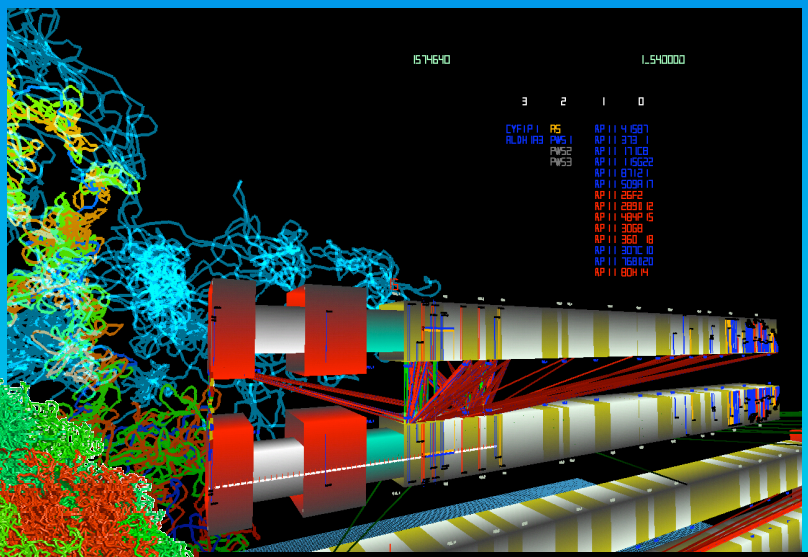

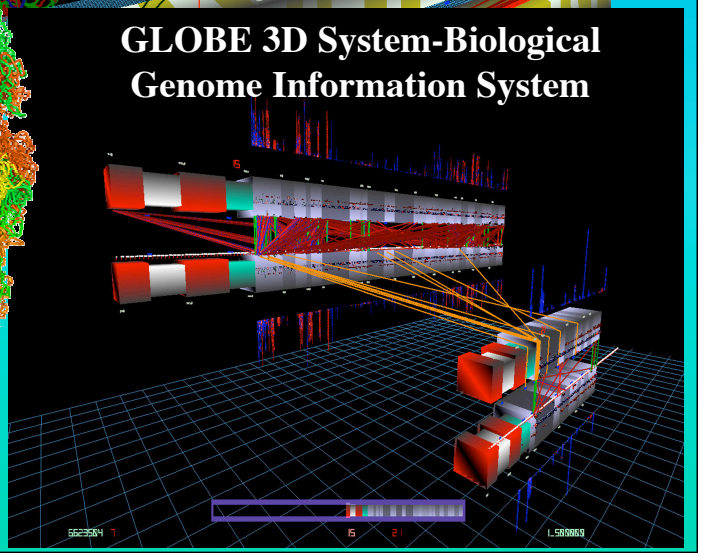

Simulation of the Organization of an Entire Human Cell Nucleus

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e-Human Ecology

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A New Direction of Cyberspace and Virtual Global Societies

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Abstract

Today advances in information technology are the basis of modern societies and internalised into live as fundamentally as basic commodities. Beyond, the creation of global cyber or virtual societies has led to entire new aspects of what should now be called e-life. The path to a virtualised world is accelerating in an enormous manner and classical society is rapidly shifting into an e-society. This has implications for all aspects of life and its holistic understanding and its perception by human ecology. New questions therefore arise and need to be addressed by human ecology ranging from classical questions as e.g. resource sharing and the tragedy of the commons in cyber space, to the relational and transformation aspects of archaic fundamentals of humans as e.g. deep psychology based religious aspects or perception of reality into e-life. Consequently, the classical human ecology will also transform to e-human ecology.

Despite the increased transformation of societies to cyber or virtual e-societies this phenomenon has been rarely investigated and understood due to lacking higher education and research in respect to human ecology. E.g. the huge amounts of money on the order of billions invested currently in the implementation of so called basic grid infrastructures for computing power, data storage and application sharing. The European Union estimates that such technologies will reach a market volume of several billion euros world wide by 2010. To build these infrastructures e.g. two e-social influences have to be overcome: i) the sharing attitude and socialization of the individual, i.e. the micro-sociality, and ii) the organization culture of the embedding institutions, i.e. the macro-sociality. However, the implications from e-human ecology, are neither established nor even investigated , thus they could contribute to this transformation to e-society.

Consequently, curricula need to be set-up in e-human ecology and elsewhere to address these questions beyond analysis and understanding of the developmental path of mankind so far. The arising future and its recursive influence on society have to be addressed in the present by reflecting on these future aspects to be able to link e-reality and e-society with reality and society.

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Human ecology, e-human grid ecology, society, social systems, e-social challenge, inverse tragedy of the commons, grid phenomenon, parallel super computing, grid computing, volunteer computing, micro-sociality, macro-sociality, autopoietic tragedy of social sub-systems, micro subsystems, macro subsystems, micro operationality, macro operationality, grid psychology micro riskmanagement, macro riskmanagement,

information browser, visual data base access, holistic viewing system, integrative data management, extreme visualization, three-dimensional virtual environment, virtual paper tool.

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