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# Incorporation of Meta-Data in Content Management & eLearning

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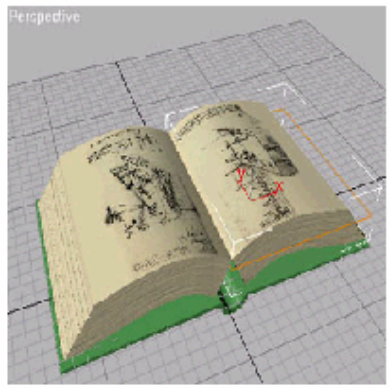
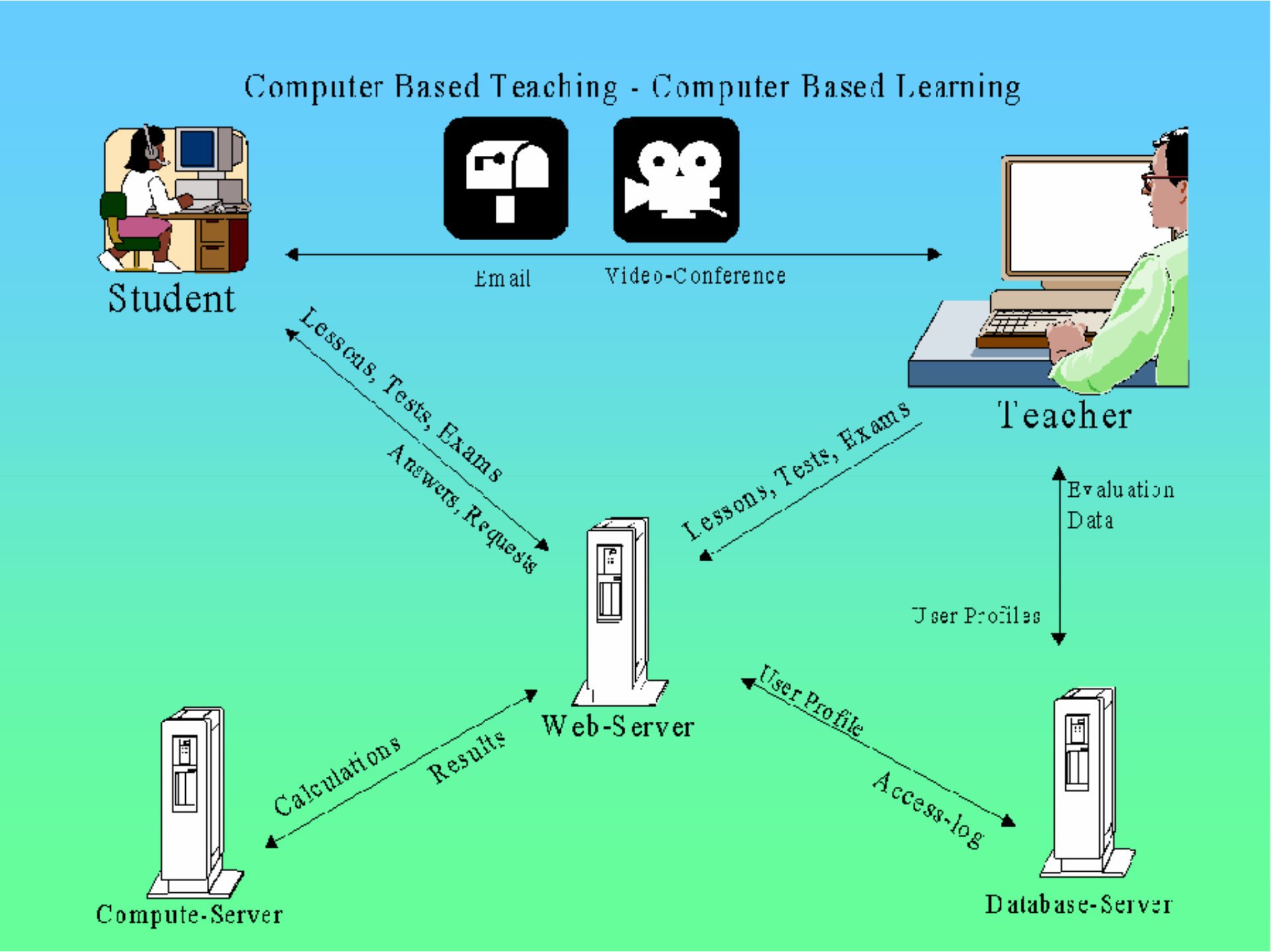
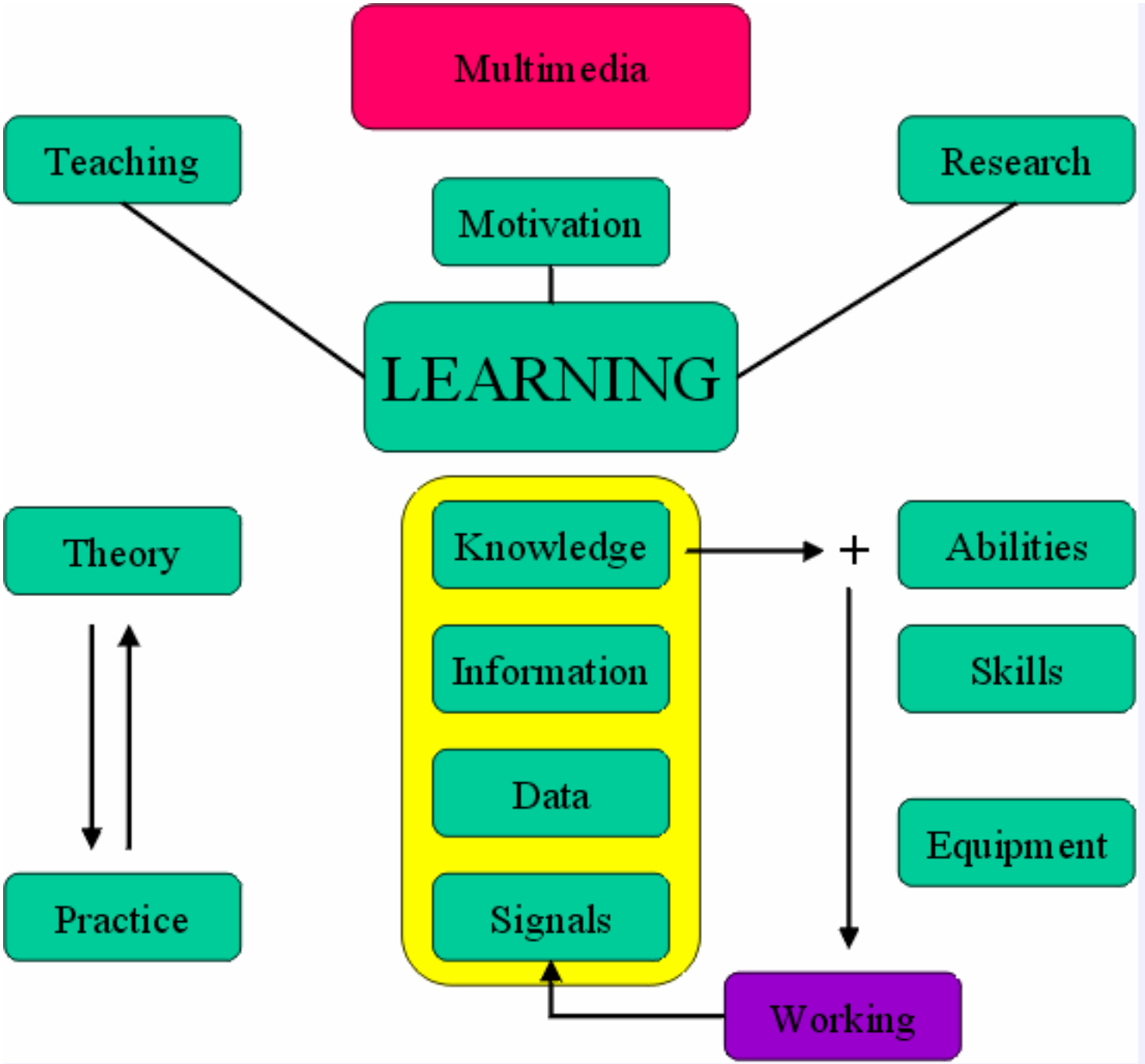
## From Gutenberg Printing to WEB Publishing and eLearning




- Traditional printed Textbook
- Electronic Books and Journals
- Online Searching & Reading
- WEB - Publishing (Re-use of data)
- New Media and eLearning
- Virtual laboratories


Computer Based Teaching - Computer Based Learning
Student
Email
Video-Conference
Teacher
Lessons, Tests, Exams
Answers, Requests
Lessons, Tests, Exams
Evaluation Data
User Profiles
Web-Server
Calculations
Results
User Profile
Access-log
Compute-Server
Database-Server


Multimedia
Teaching
Research
Motivation
LEARNING
Theory
Knowledge
+
Abilities
Information
Skills
Data
Equipment
Practice
Signals
Working

## Client - Server Architecture

- HTML documents (Server / Browser)
- dynamic HTML (JavaScript, CSS)
- Pictures (SVG), Animations, Videos (MPEG4)
- 3D molecular structures and dynamics (Chime plugin)
- Flash & Shockwave animations (Macromedia)
- VRML 1 & 2 (Cosmo-, Cortona- player)
- Java, Java Applet, Java2, Java3D
- online calculations (Perl Scripts, Servlets, CGI)
- XML (eXtensible ML, DTD, XSLT)

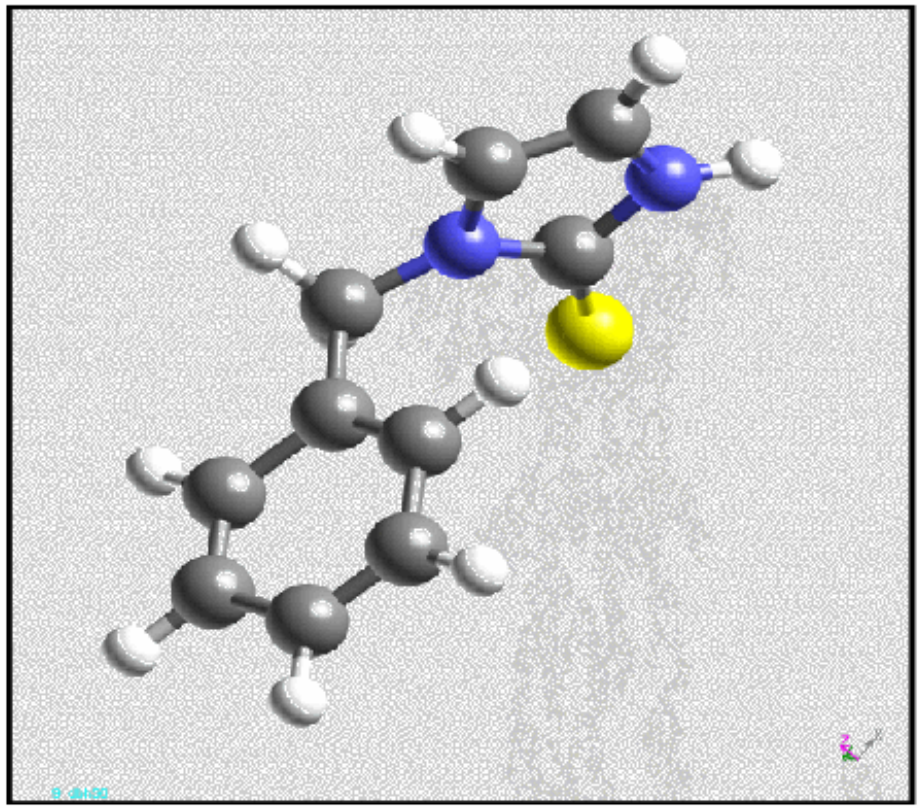
Navigation & User Interactivity

Using concepts & models instead of memorizing facts

# Multimedia Publication: Chemical Innovations on the Web

- High Quality Content
  - Presented the way the users want (Re-use, extensible)
  - Searchable the way the users expect (on-line)
  - New and Novel features (not just page integrity)
  - Three-dimensional objects (3D with CHIME)
  - Visualization of Object Dynamics (VRML 1.0 / 2.0)
  - Editable content
  - Highly structured data (CML, MathML)
  - Finely Grained data
  - Collaborative
  - Content separated from Layout (+DTD, Meta-Data)
  - XML and Java --> HTML, PDF, User Interactivity
- Emphasis on Content over Style Leads to Quality!

# 3D Structure of Molecules - the most important data in chemistry



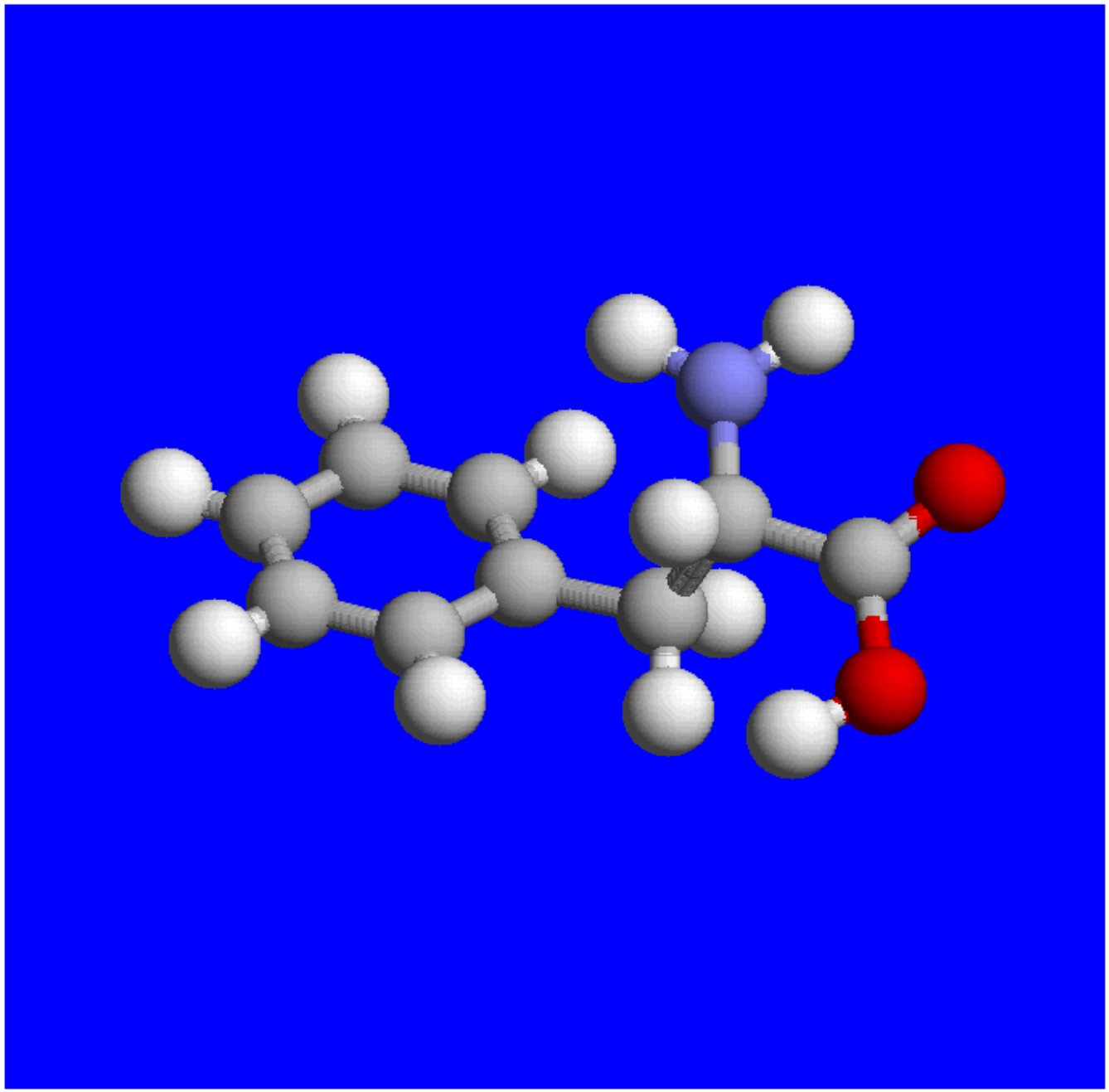
# Structure and Dynamics

| Geometric | Electronic | Energetic |
|---|---|---|
| Position of Nuclei | ‚Position' of Electrons | Interactions n - e |
| Cartesian coordinates | Electron density | Total energy |
| Internal coordinates (Z-mat) | Atomic Charge | Orbital energies (Frontier orb) |
| Shape | Polarity | Atomisation energies |
| vdw-Surface | Dipole moment (Vector) | Dissoziation energies |
| Volumn | Polarisability (Tensor) | Binding energies |
| Rendering | Electronegativity | Heat of Formation |
| Wire - Modell | Hard- and Softness (HSAB) | |
| Ball & Stick | MEP | |
| CPK | MLP | |
| Iso-Surface (Connolly) | Donor- und Acceptor-numbers | |
| PovRay (light, shadow, reflex) | | |

→ Properties (microscopic/macroscopic)

→ Catalysis, biochemical activity

**Open File:** Inorg. Inorganics | Org. Organics | Bio. Bio-Structures | Dyn. Dynamics



☒ Wire ☒ Stick
☒ B&S ☒ CPK
☒ Label ☒ 5 ☒ 12
Light ☒ 25 ☒ 50 ☒ 75
Geometry: ☒ 2 ☒ 3 ☒ 4
☒ -H ☒ Dots
☒ H-bonds ☒ Ribbon
☒ Surface ☒ +/-
☒ MEP ☒ MLP
☒ Z-clip ☒ +5 ☒ -5
**Zoom** 3 ☒ ☒ ☒ 1
☒ Axis ☒ Box
☒ Dynamics-Animation
**Rotation:** ☒ X ☒ Y ☒ Z
**Bg-col:** ☒ w ☒ g ☒ s ☒ b
☒ RESET
☒ COPY2CLIP

# Animationen / 3D Virtuelle Scenarien

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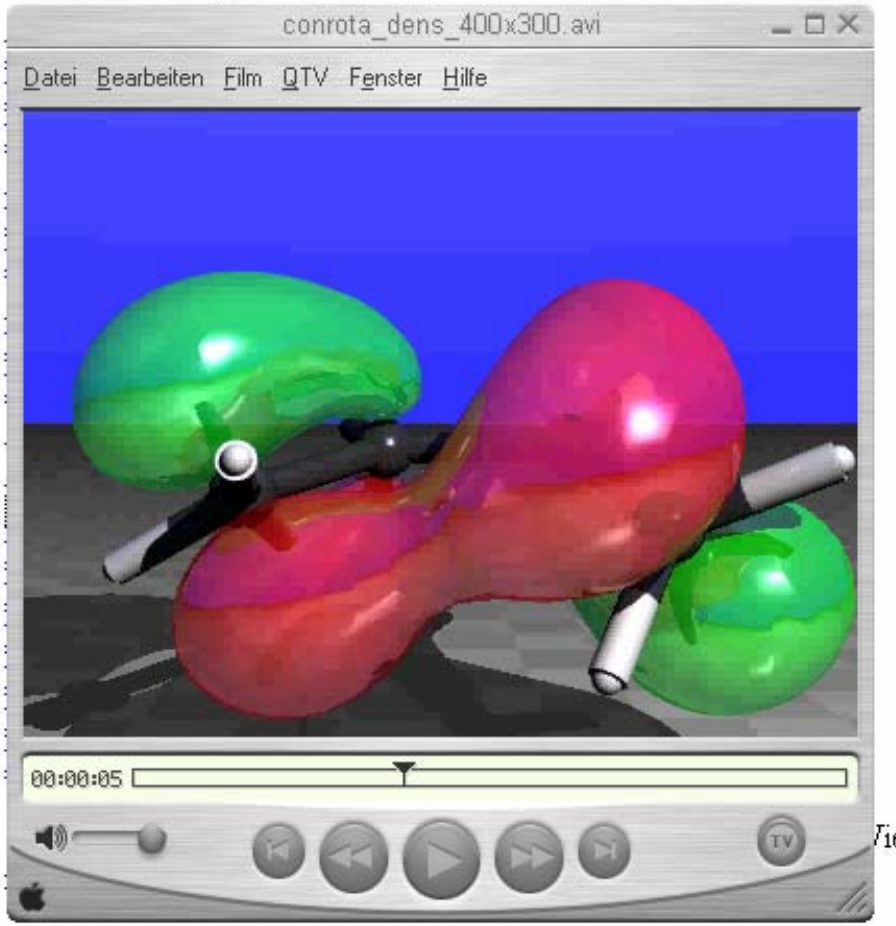
Here are some applications of VRML.

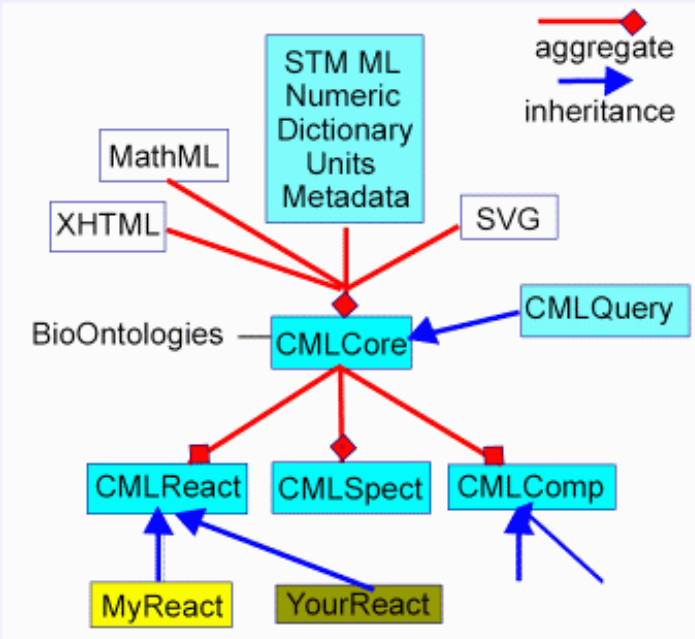



iewer, den man über den BACK-Button verlassen kann, um in diesem Material

# About CML

In particular we note here how the original CML specification can be extended by modularisation into a **Core namespace** , and extended via other schemas into e.g.

- **CMLReact**. A reaction, containing *reactantLists*, *productLists* and *links* between them.
- **CMLComp**. A container for computational and simulation input and results
- **CMLQuery**. A generic query language
- Hooks for other Schemas such as e.g. **SpectHook**, for spectral parameters and data, and links to molecular details (assignment)




[see: Peter Murray-Rust]

# XML-Editor and Server

- XML-Editor (XMLSpy) + CML + MathML + DTD
- Cocoon / Apache -Server + CSS --> HTML or PDF (Client-Browser)
- SQL-DB Java-Servlets
- Online Computation (Quantum Mechanics: G98) Servlet ---> XML
- Java-Applets and Java Interactions (Orbital-Iso-Surfaces)
- Problems in XML (types: multiple choice ...)
- User data (overview about inspected modules and solved problems)

# Metadata Standards

- IMS Global Learning Consortium
  - XML, schema, DTD (examples)
  - http://www.imsglobal.org/
- Dublin Core Metadata Initiative DCMI
  - development of interoperable online metadata standards (Registry)
  - Working Group
  - hptt://dublincore.org/....
- Shared Content Object Reference Model SCORM
  - Advanced Distributed Learning (ADLNet)
  - "Content Aggregation Model" in XML
  - http://www.adlnet.org/
- IEEE Learning Technology Standards Committee LTSC
  - IEEE P1484.12 Learning Object Metadata Working Group LOM
  - http://ltsc.ieee.org/

# Summary and Conclusions

- XML, CML, MatML, .... for data in the WWW
- Meta-data for qualified Search and Access
- New Data Types: 2D Maps, 3D-Structures, 3D-Dynamics
- These will be available for individual Inspection and Re-use
- This enables for better way of Learning and to improve our KNOWLEDGE
- Online Computing and Modeling in the network is possible
- This enables for world-wide Collaboration and Research (team work)
- user-friedly interactive Visualizations