Center for LifeLong Learning & Design

University of Colorado at Boulder

Wisdom is not the product of schooling but the lifelong attempt to acquire it.
- Albert Einstein

What's on the Horizon?
—
Lifelong Learning: New Mindsets and New Media

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Learning in Different Worlds

dimension	old paradigm	new paradigm
information	scarce	plentiful
reproduction of documents	expensive and restricted	cheap
specialization	low	high
change within a human life time	slow	fast
interaction / collaboration	physical proximity	shared professional interests
economy	rigid, hierarchical organizations, long-term personal identity	dynamic economy, flexibility, networking, eroding the sense of sustained purpose, no long-term

L^{3}D's Research Focus

- **Artificial Intelligence (AI) → Intelligence Augmentation (IA)**
  - replacement → empowerment
  - emulate → complement (exploit unique properties of new media)

- **instructionist learning → constructionist learning**
  - learning about → learning to be
  - when the answer is known → when the answer is not known (collaborative knowledge construction)

- **individual → social**
  - knowledge in the head → creating shared understanding, distributed cognition
  - access → informed participation

- **things that think → things that make us smart**
  - what computers can do → what people and computers can do together
  - computational → computational and physical

- **"gift-wrapping" with new media → tradition and transcendence**
  - technology → co-evolution of media and new theories about thinking / working / learning / collaborating

LifeLong Learning

- **more than "adult education"** → it tries to cover and unify all phases: intuitive learner (home), scholastic learner (school and university), skilled domain worker (workplace)

- **learning is a new form of labor** → integration of learning, working (teaching) and collaborating

- **changes:**
    - from means → ends
    - from medium → content
    - from computers → tasks, services
    - from specialist → every-day life
    - from "learning *about* computers" → "learning *with* computers"

School Learning and Lifelong Learning

	School Learning	Lifelong Learning
emphasis	"basic" skills	education embedded in ongoing work activities
potential drawbacks	decontextualized, not situated	important concepts are not encountered
problems	given	constructed
new topics	defined by curricula	arise incidentally from work situations
structure	pedagogic or "logical" structure	work activity
roles	expert-novice model	reciprocal learning
teachers	expound subject matter	engage in work practice
mode	instructionism (knowledge absorption)	constructionism (knowledge construction)

Co-Evolution: Beyond "Technology-Driven Developments" and "Gift-Wrapping"
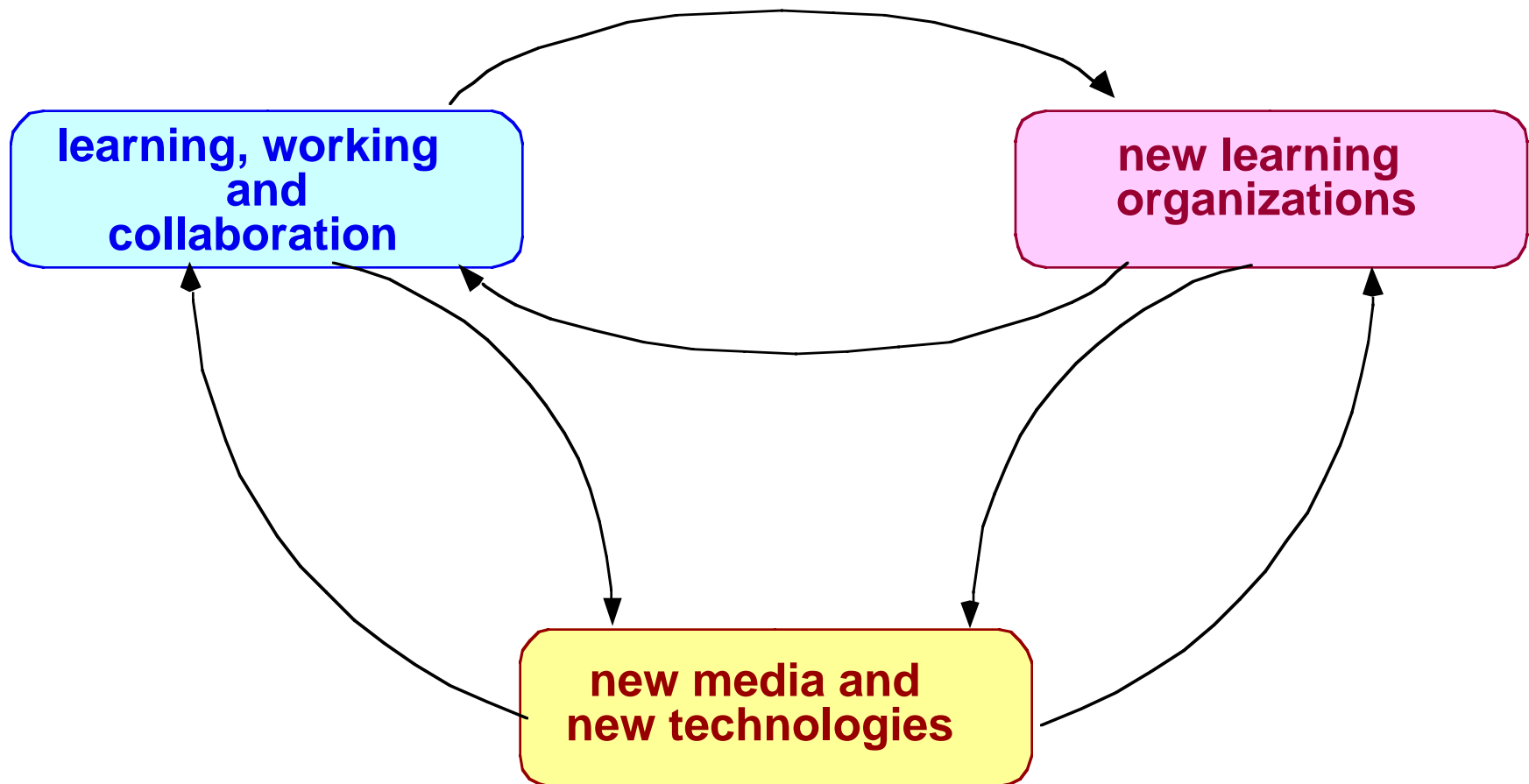
"Technology-Driven Developments"

Education = f{Media, Technology}⬅➡Media,Technology = f{Education}
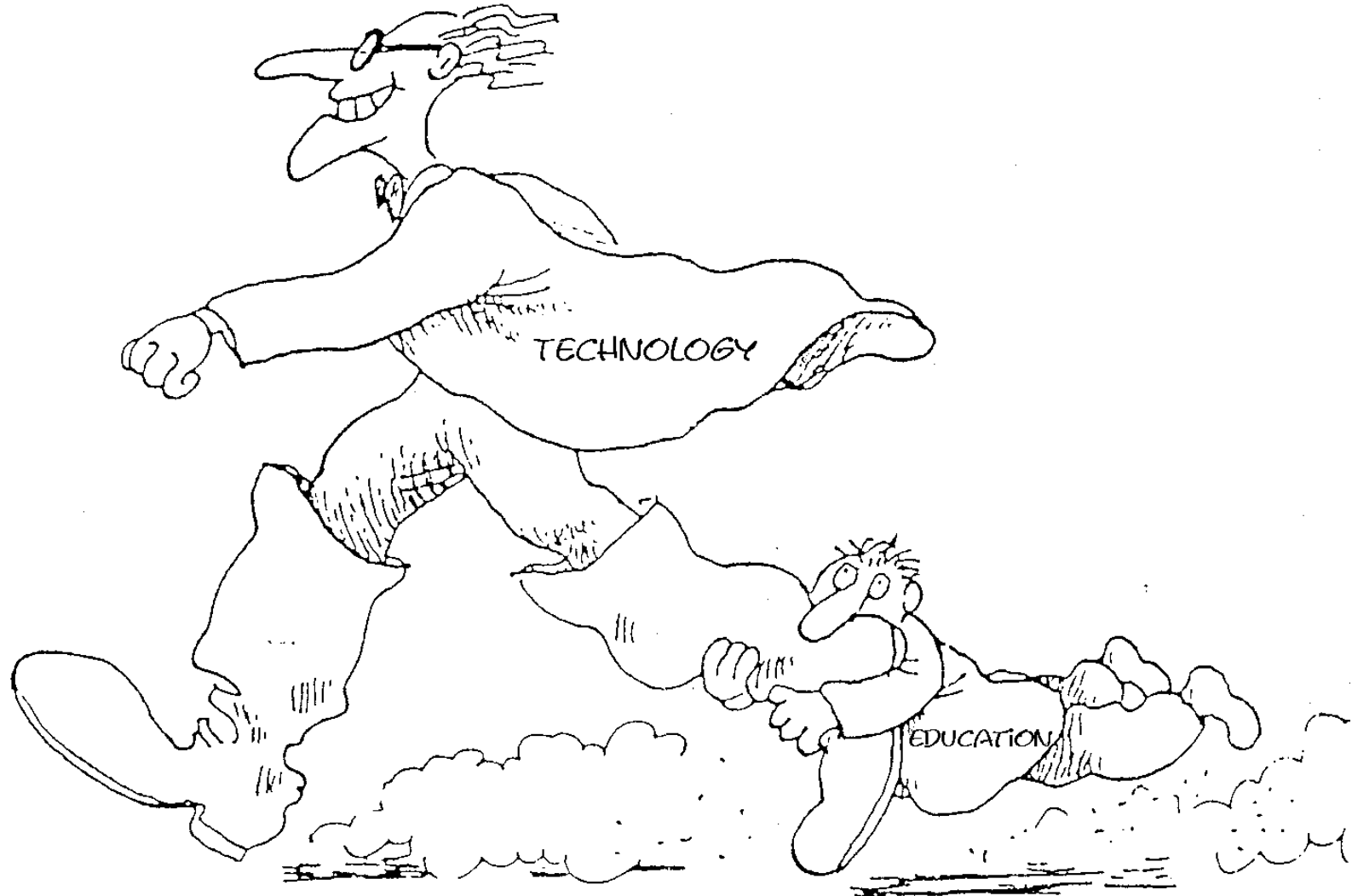
"Gift-Wrapping" and Beyond

- **Peter Drucker: "There is nothing so useless as doing efficiently that which should not be done at all."**
  - example: "webify your courses'

- **claim:**
  - *"old" frameworks* such as instructionism, fixed curriculum, memorization, decontextualized learning, ... do not get changed by technology itself (e.g., intelligent tutoring systems, expert systems, multimedia, networks)

  - *"new" frameworks:* lifelong learning, integration of working and learning, learning on demand, problem-based learning, authentic problems, self-directed learning, (intrinsic) motivation, collaborative learning, organizational learning, "open systems" approaches, ……

- **beyond a consumer mindset** → new civic discourses are required, because one of the major roles for new media and new technologies is not to deliver predigested information to individuals, but to provide the opportunity and resources for social debate and discussion
  - → for details see: G. Fischer: "Beyond 'Couch Potatoes': From Consumers to Designers", at **http://www.cs.colorado.edu/~gerhard/papers/apchi-98.pdf**

New Forms of Learning of Importance to Lifelong Learning

Form	Comple-menting Form	Contribution toward Mindset	Major Challenges	Media Requirements
learning to be	learning about	becoming a member of a community	scaling up (a Ph.D. experience for undergraduates)	social creativity, meta-design, boundary objects
self-directed learning	prescribed learning	authentic problems culture of inquiry	problem framing purposive activities	understanding evolving tasks
learning on demand	learning in advance	coverage is impossible obsolescence is guaranteed	identifying breakdowns integration of working and learning	critics support for reflection-in-action
informal learning	formal learning	learning by being in the world	larger, purposive activities provide learning opportunities	end-user modifiability
collaborative learning	individual learning	community social capital	shared understanding informed participation	boundary objects group memories

Examples from L^{3}D's Work

- **theories**
  - lifelong learning → making learning a part of life
  - beyond access → informed participation
  - breakdowns and critiquing as a source for individual learning
  - symmetry of ignorance as a source for collaborative learning

- **systems**
  - AgentSheets   http://www.agentsheets.com/
  - Dynasites   http://Seed.cs.colorado.edu/dynasites.documentation.fcgi
  - LivingOM   http://katana.cs.colorado.edu:8080/livingOM
  - Envisionment and Discovery Collaboratory (EDC)
              http://www-l3d.cs.colorado.edu/~l3d/systems/EDC/
  - PiTaBoard   "Participate in the Action"

- **practice**
  - classrooms as design studios → **examples:**
    - http://webguide.cs.colorado.edu:3232/atlas (Swiki)
    - http://www.cs.colorado.edu/~l3d/courses/atlas-2000/ (Dynasite)
  - teachers as lifelong learners → working shops, virtual libraries

- **assessment**
  - "understanding" mindsets
  - new assessment approaches for design-based education: motivation, interest, participation in communities of learners, long-term longitudinal assessment

http://Seed.cs.colorado.edu/dynasites.Documentation.fcgi$node=dynasites.doc.home

- dynamic, extensible and integrated web-based information spaces

- supports the collaborative creation and evolution of artifacts through which communication can take place

- **examples:**
  1. **Dynagloss** — a decentralized, dynamically evolved space of concepts
  2. **Living Book** — an information space evolving as a side effect of interaction between readers
  3. **DynaClass** —a DynaSites document type developed for class discussions and workshops
  4. **Virtual Library —** used extensively at New Vista High School

The Envisionment and Discovery Collaboratory (EDC)

*http://www.cs.colorado.edu/~l3d/systems/EDC*

- **creating shared understanding through collaborative design**
    - symmetry of ignorance, mutual competence, and breakdowns as sources of opportunity

- **integration of physical and computational environments**
    - support and exploit face-to-face collaboration
    - hardware: touch-sensitive electronic whiteboards, crickets
    - software: AgentSheets, DynaSites
    - beyond the screen: immersive environments

- **support for reflection-in-action**
    - action space: AgentSheets, Visual AgenTalk
    - reflection space: DynaSites, WWW

- **open system —** seeding, evolutionary growth, reseeding process model

The Envisionment and Discovery Collaboratory (EDC)

The Envisionment and Discovery Collaboratory
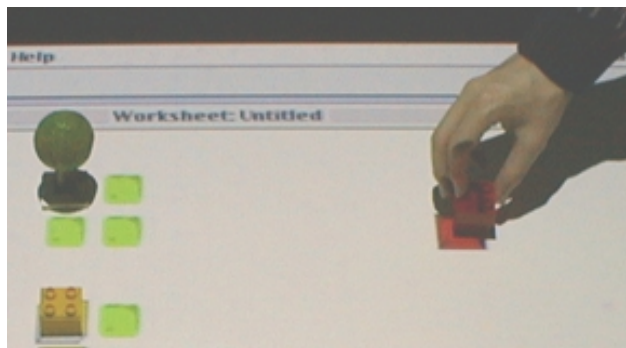
Boundary Objects and the EDC

- **physical and computational languages to "think-with" and to "act-with"** —a common language meaningful to all stakeholders

- **simulations** —dynamic feedback meaningful to all stakeholders

- **reflection spaces** —explicit information helping stakeholders remember what they have learned and to consider other perspectives

- **open, evolvable tools** — capturing important information not anticipated at system design time by encouraging a culture of participation, that addresses the open-ended nature of problems
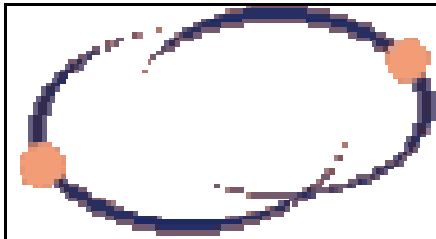
The Participate-In-The-Action (PITA) Board

based on: DGT electronic chessboard, NL; http://www.dgtprojects.com/

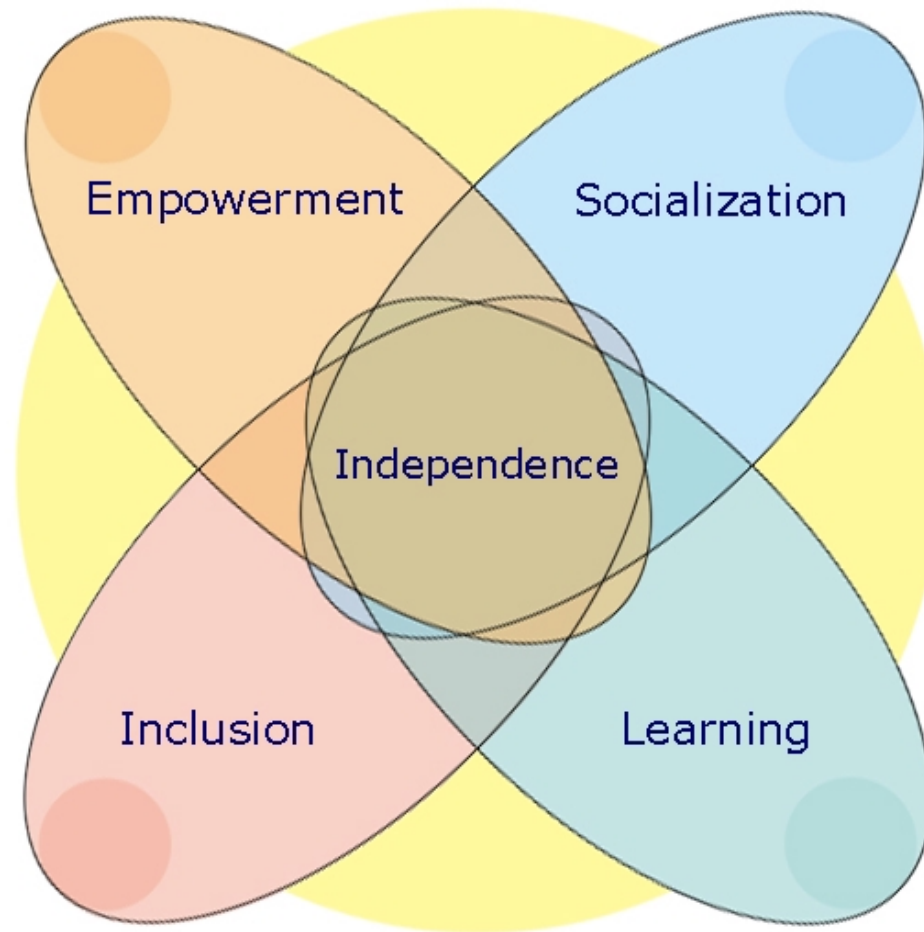- supporting alternative *processes* (in addition to the EDC) to create *content*

Cognitive Levers (CLever): Helping People Help Themselves

A L3D Project funded by the Coleman Family Foundation / Institute

Empowerment

Socialization

Independence

Inclusion

Learning

Assessment: Understanding the Mindsets of Students
—
Feedback from Students Taking one of Our Courses

a negative comment: *"I will not ever take a course of this nature again in my undergraduate career, and I hope to find a more structured graduate program with an adviser that is more forthcoming. I will reinforce my strengths by continuing to study in the method that I have developed over the past 15 years. I will redirect my weaknesses by avoiding unstructured class environments."*

a positive comment: "*When I signed up for this class I had no idea what it was going to be about. Once I started understanding the material, however, I was extremely thrilled and interested to be a part of one of the most progressive courses on campus. I'm not sure what specifically to say except that I rank this class in the top three that I've taken at CU. The self-directed nature of the work ensured that I wouldn't be bored or unchallenged, and the interplay between all of us was a lot of fun. After four and a half years in college, I can honestly say that this is one of the first courses where I was treated as an adult, a fact which means more to me than I can describe."*

Mismatches

Teacher	Student	Example
authority ("sage on the stage")	dependent, passive	lecture without questions, drill
motivator and facilitator	interested	lecture with questions, guided discussion
delegator	involved	group projects, seminar
coach/critic ("guide on the side")	self-directed, discovery-oriented	self-directed study group, apprenticeship, dissertation

What Are Students Used To?

- **consumers of education**

- **teacher, learner = f{ person}**   (instead of: teacher, learner = f{context})

- **students believe that problems have an answer** and that the teacher has to know the answer

- **unwilling to engage in peer-to-peer learning** (no surprise in a culture in which collaboration is mostly treated as "cheating")

- **learn to get good grades** (instead of: learning based on interest, passion, enjoyment, intrinsic motivation)

- **sole assessment by teachers** (instead of: self-assessment)

Open Systems
—
A "New" Learning Paradigm for the 21st Century?

- **an intellectual paradigm requiring a new mindset**
    - objective: leverage is gained by engaging the whole world as a talent pool
    - from users/consumers → co-designers/active contributors

- **some examples of decentralized, evolvable open systems**
    - **open source**: collaborative development of software
    - **open systems:** the scientific method/enterprise
    - insight: "software and knowledge is not a commodity to be consumed but is a collaboratively designed and constructed artifact"

- **some characteristics:**
    - evolutionary design of complex systems
    - success stories so far: technically sophisticated developers — not end-users
    - relies on **social capital** (in gift cultures, social status is determined not by what you control but by *what you give away)*

Challenges

- **costs versus quality**: role and value of "residential, research-based universities" in the global, educational market of the future → "If you think education is expensive, try ignorance!"

  - **creating new mindsets → from consumers to designers**
  - Illich (in *Descholing Society*): *"schools and universities = reproductive organ of a consumer society"*
  - technical challenges (open systems, end-user computing) and social challenge (change mindsets and cultures)

- **learning on demand and "basic" skills**: if most job-relevant knowledge must be learned on demand
  - what is the role of "basic" skills?
  - what is the critical background knowledge which makes learning on demand feasible?

- **"school-to-work" transition:**
  - if the world of working and living relies on collaboration, creativity, definition and framing of problems, dealing with uncertainty, change, distributed cognition, symmetry of ignorance, ...
    - *→ then the world of schools and universities need to prepare students to be able to have a meaningful life in this world*

Conclusions

- **the future is not out there to be "discovered" — it has to be invented and designed not only**
    - by Hollywood

    - by info-enthusiasts

    - based on technological determinism

- **it has to be invented and designed by:**
    - exploring **the fundamentally new possibilities and limitations of computational media** on how we think, create, work, learn, collaborate,

    - moving beyond "technology-driven development" and "gift-wrapping" to **co-evolution**

    - **changing of mindsets** (of learners, teachers, researchers, administrators, institutions, and cultures)