



An Open Access Approach to High-Quality Affordable Textbooks

Richard Baraniuk Joel Thierstein

Rice University

born of frustration – 1999

high cost of textbooks and learning materials

- limits access

difficult to **connect** across concepts, courses,
grades, curricula

- grade K | 1 | 2 | 3 | ... | 11 | 12 | AP | CC | college
- curricular stove-piping, disintegration

difficult to **share** and build **communities,**
collaborations among faculty, students

- inefficient: no economies of scale
- constantly “reinventing the wheel”
- glacial time scales of development and updating

open access movement

democratization – knowledge should be *free* and *open* to use and re-use

draws inspiration from open-source software



Linux, Apache, Mozilla, Firefox



enabled by recent developments in info tech

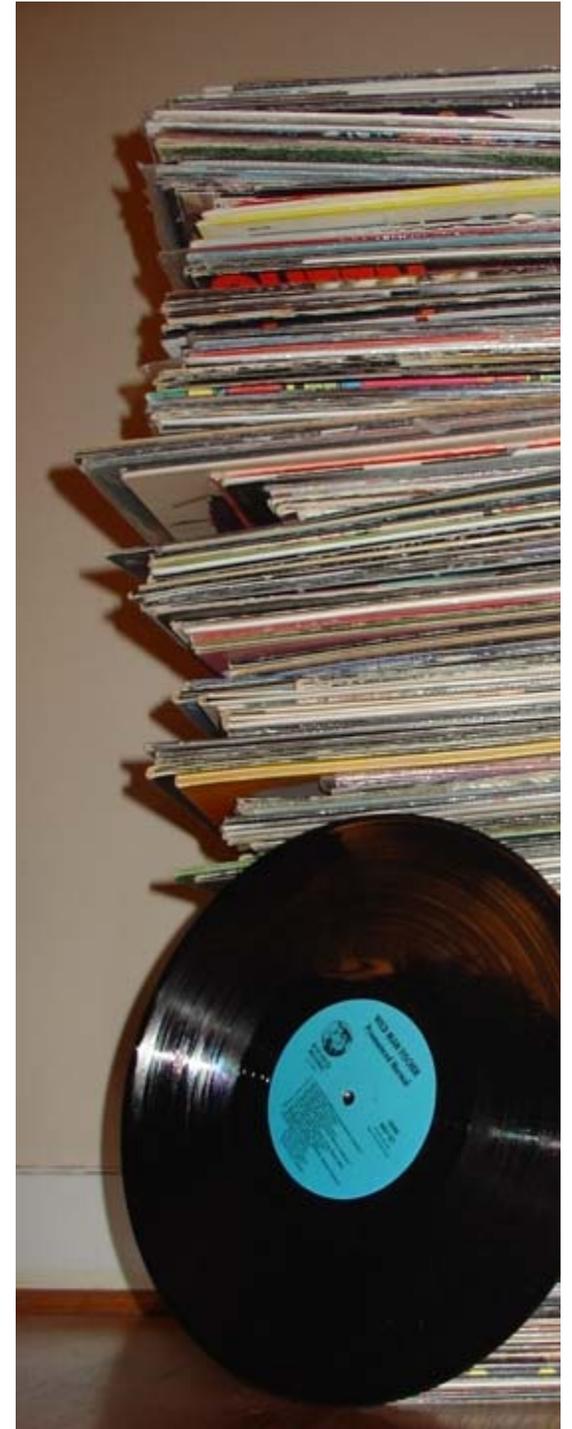


create
rip
mix
burn

vibrant
interactive
community
connected
innovative
up-to-date
inexpensive



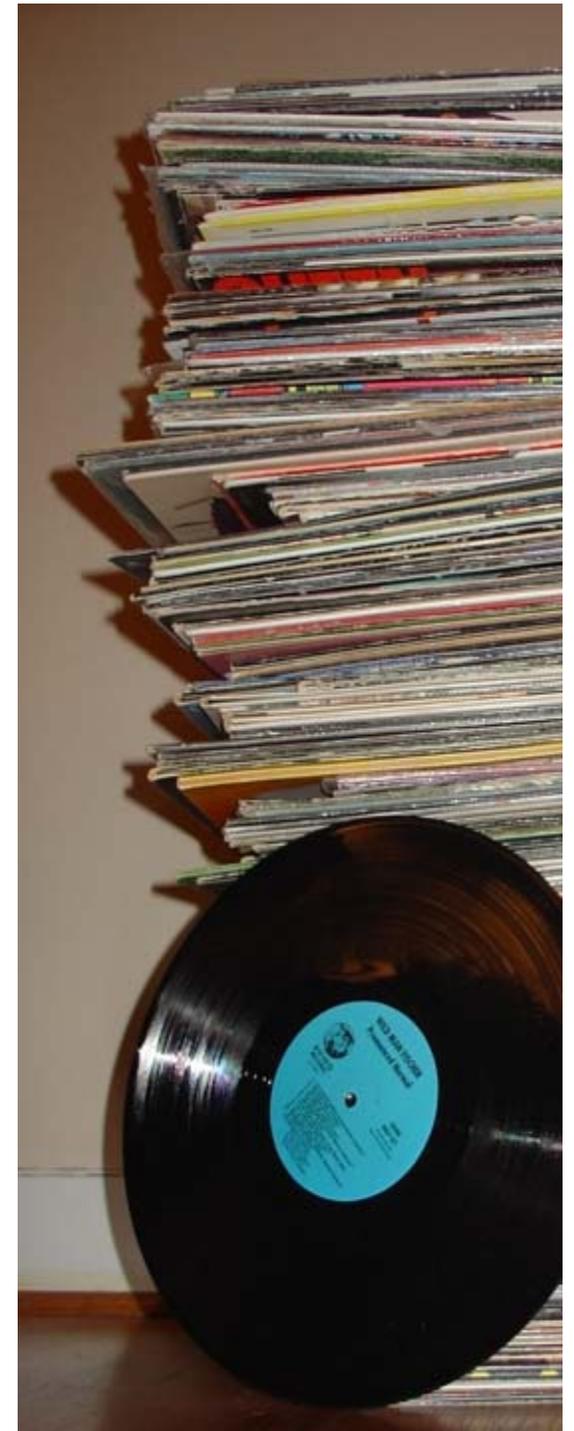
Apple





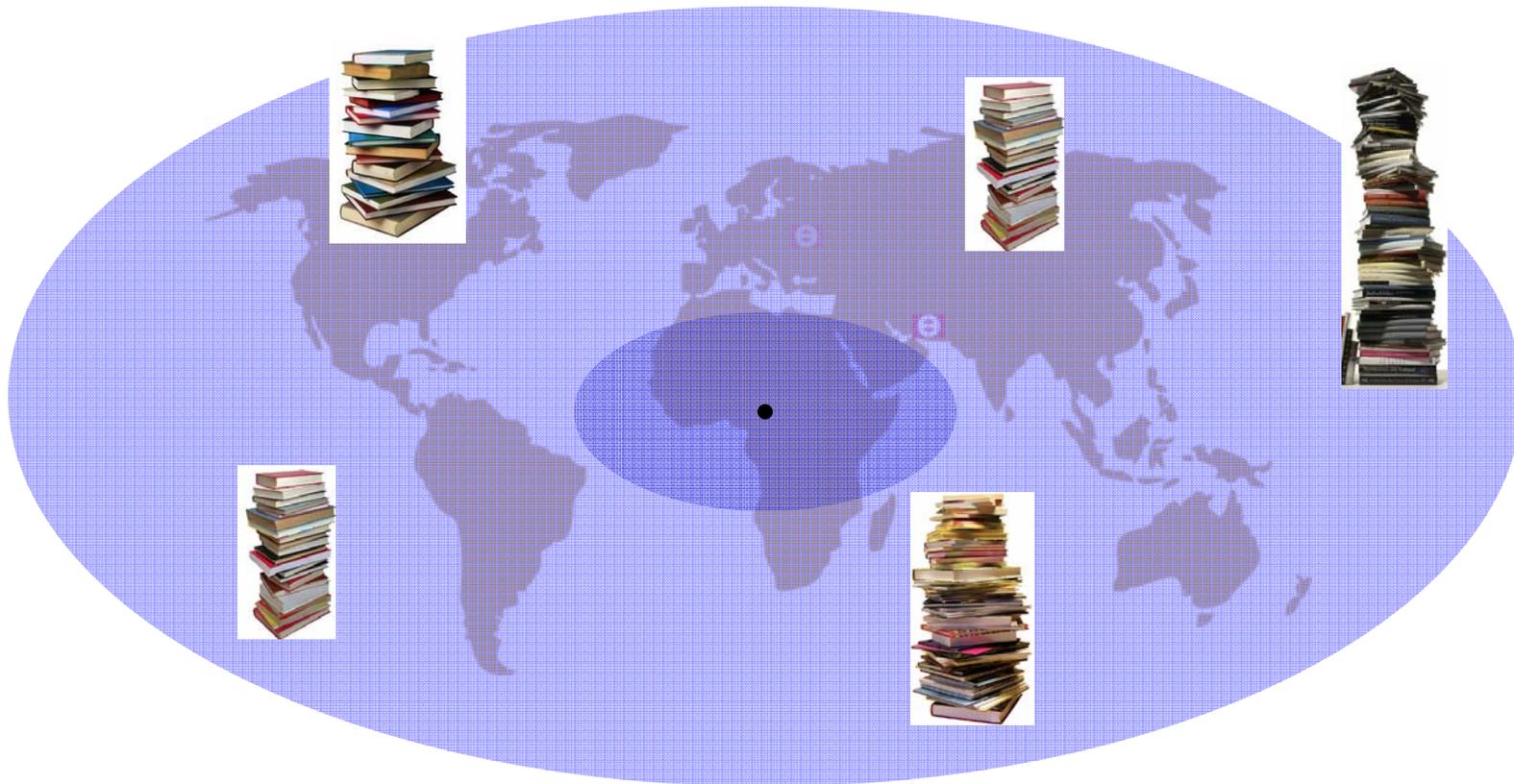
create
rip
mix
burn

~~vibrant
interactive
community
connected
innovative
up-to-date
inexpensive~~



1. liberate course materials

book	>>>	page	[XML]
shelf	>>>	interconnected global repository	
closed	>>>	open source	[Creative Commons license]
\$	>>>	free	
slow	>>>	fast	



Connexions repository



textbook / course



personalized courses



author
retains
copyright

but
opens
access
via
**open
license**



Attribution 2.0

You are free:

-  **to Share** — to copy, distribute and transmit the work
-  **to Remix** — to adapt the work

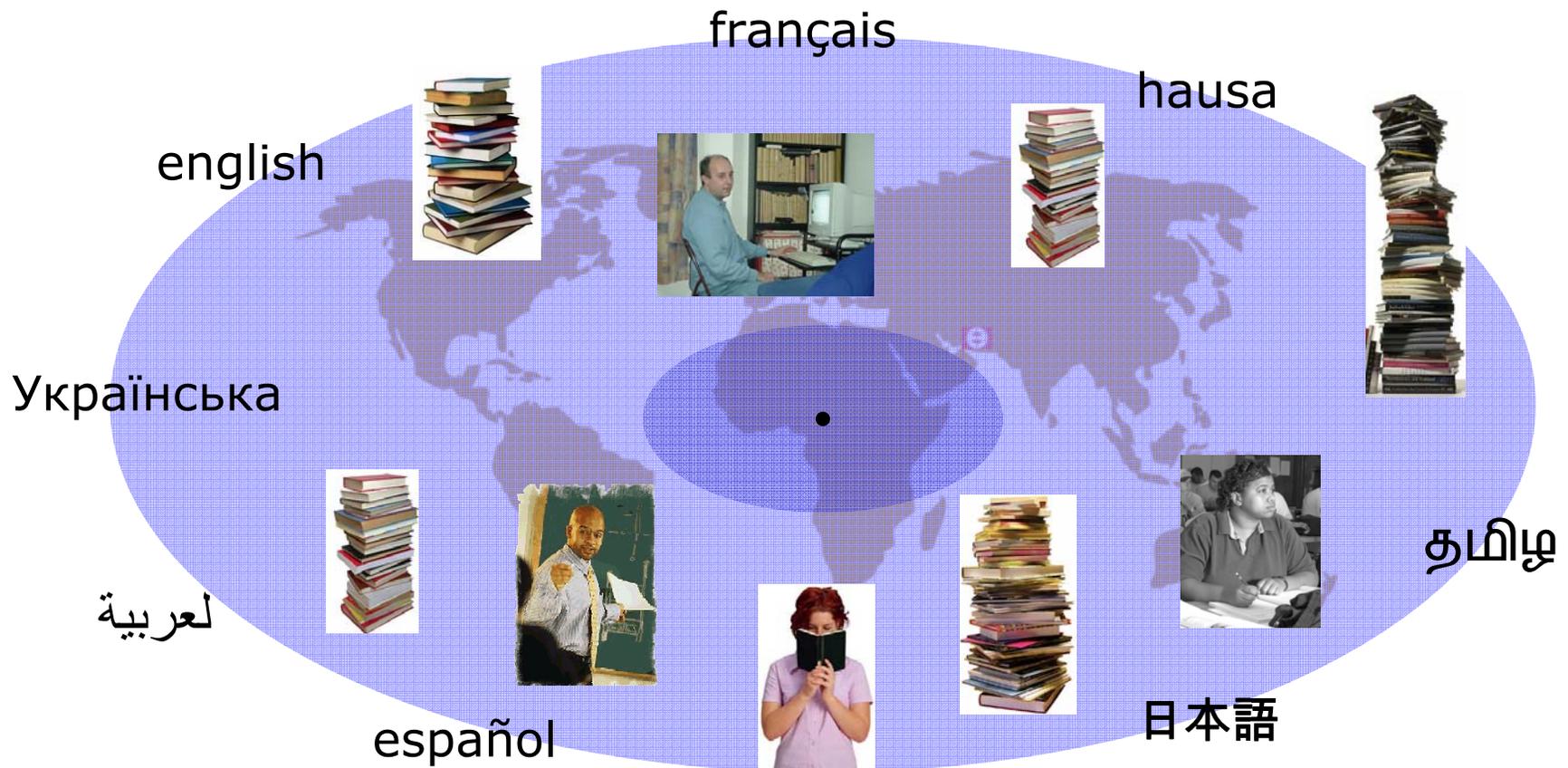
Under the following conditions:

-  **Attribution**. You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work).

2. invite participation

inclusive *communities*

grassroots organization



textbook pipeline

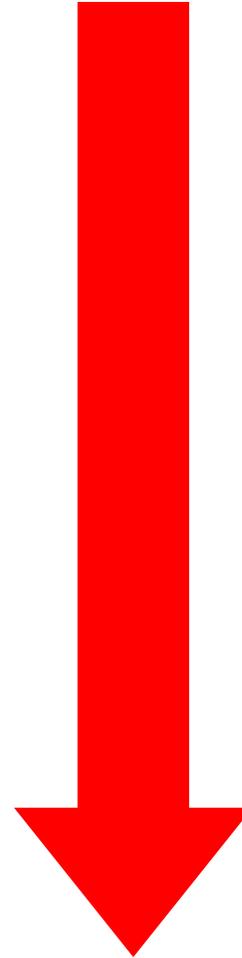
authoring

editing

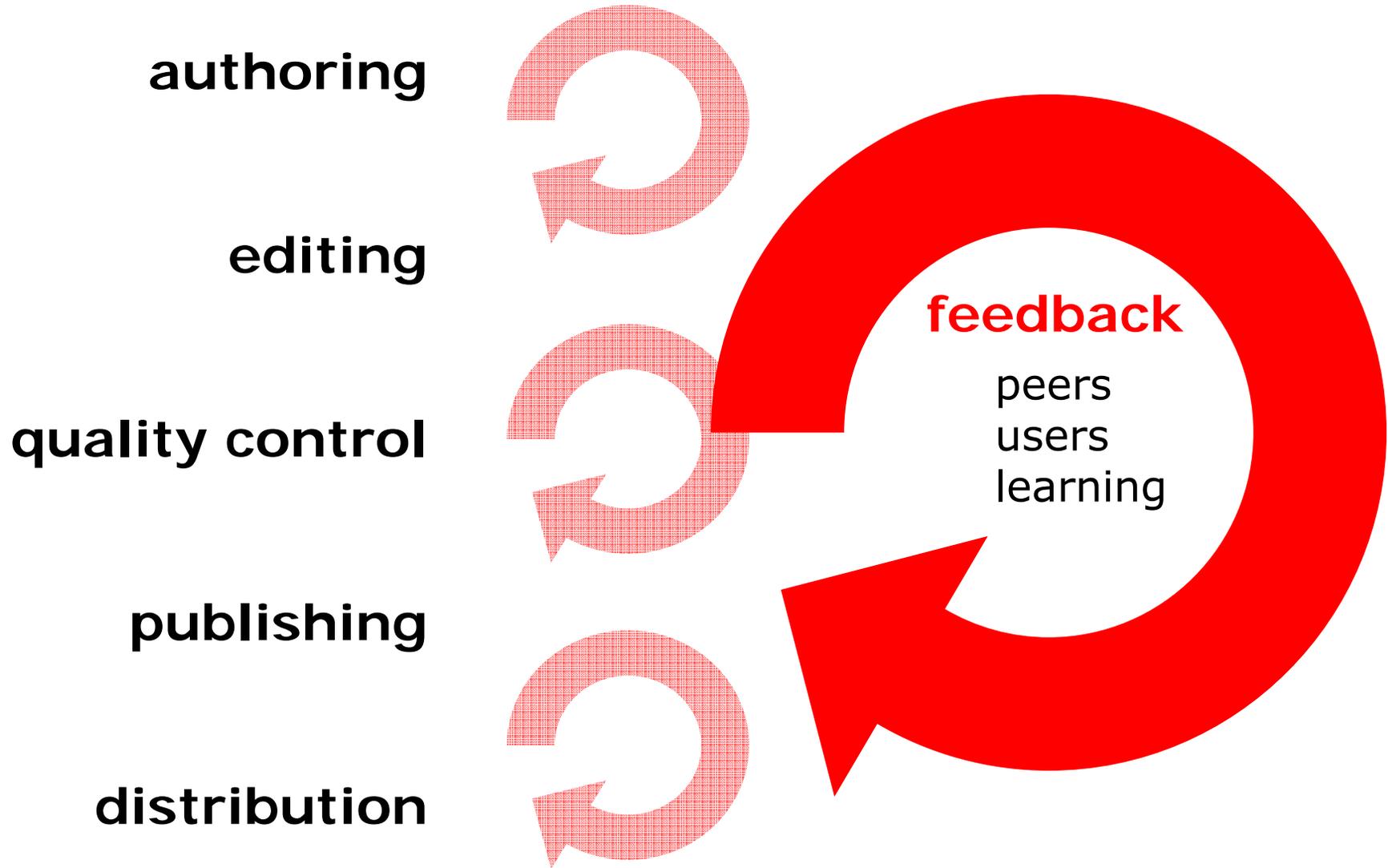
quality control

publishing

distribution



open education ecosystem



create

rip

mix

burn

anyone can become an author...

create

RELATED MATERIAL

Similar content

- [Complex Fourier Series and Their Properties](#)
- [Fourier Series: Eigenfunction Approach](#)
- [Orthonormal Basis Expansions](#)

MORE »

Courses using this content

- [Signals and Systems](#)

Fourier Analysis in Complex Spaces

[Print \(PDF\)](#)

By: [MICHAEL HAAG](#), [JUSTIN ROMBERG](#)

Summary: This module derives the Discrete-Time Fourier Series (DTFS), which is a fourier series type expansion for discrete-time, periodic functions. The module also takes some time to review complex sinusoids which will be used as our basis.

Introduction

By now you should be familiar with the derivation of the [FOURIER SERIES](#) for continuous-time, periodic functions. This derivation leads us to the following equations that you should be quite familiar with:

$$f(t) = \sum_n (c_n e^{j\omega_0 n t})$$

$$c_n = \frac{1}{T} \int f(t) e^{-j\omega_0 n t} dt$$

$$= \frac{1}{T} \langle f, e^{j\omega_0 n t} \rangle$$



frequency $\omega_0 n$ in $f(t)$.



- stanford
- illinois
- michigan
- wisconsin
- berkeley
- ohio state (1)
- ga tech
- utep
- rice (2)
- cambridge
- norway
- italy



(login required)

In this module, we will derive a similar expansion for discrete-time, periodic functions. We will derive the **Discrete Time Fourier Series** (DTFS), or the

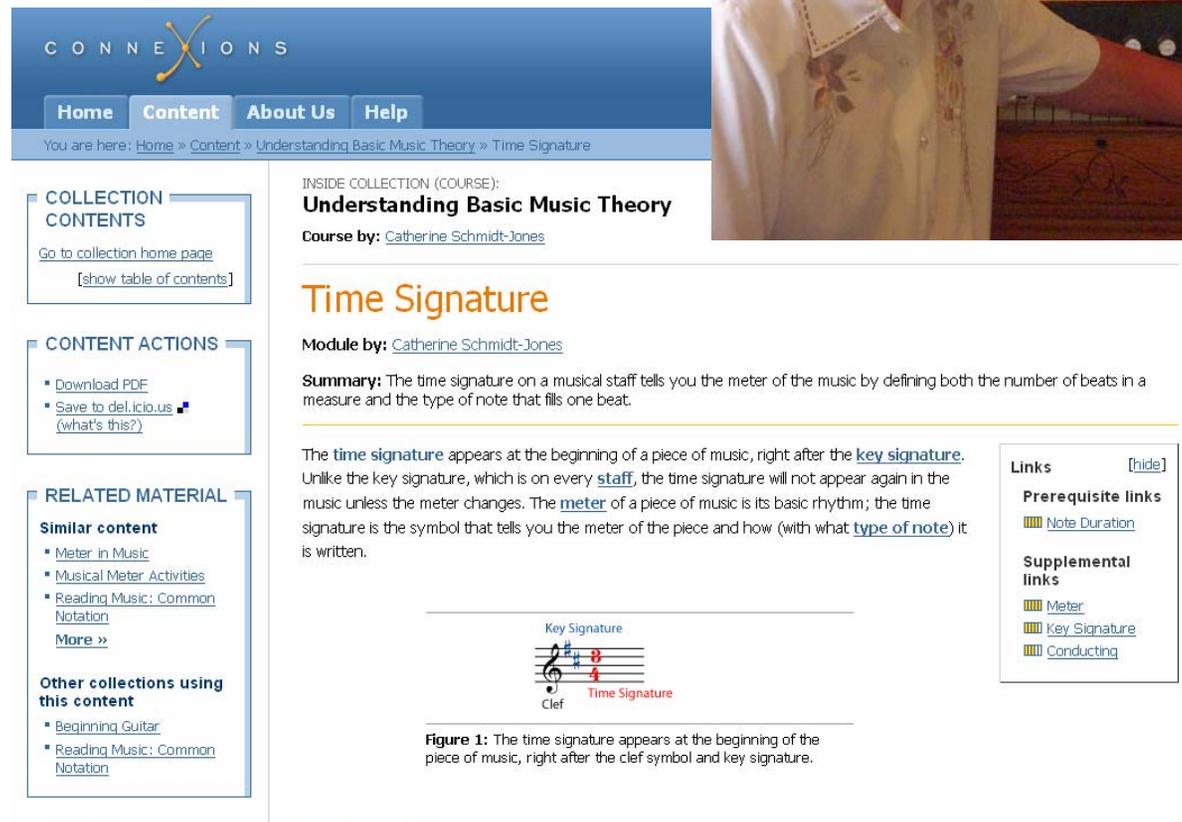
create

Catherine Schmidt-Jones

8.5 million page views to date

many by
US teachers
and faculty

but also
Mongolia...

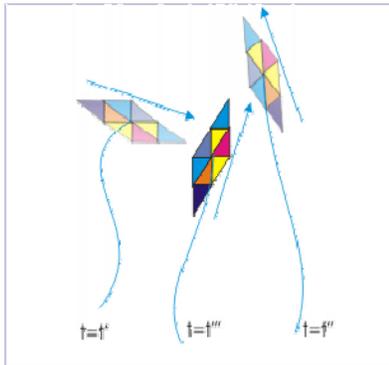


The screenshot shows a website interface with a blue header containing the logo 'CONNECTIONS' and navigation buttons for 'Home', 'Content', 'About Us', and 'Help'. Below the header is a breadcrumb trail: 'You are here: Home » Content » Understanding Basic Music Theory » Time Signature'. The main content area is titled 'INSIDE COLLECTION (COURSE): Understanding Basic Music Theory' and lists the course author as 'Catherine Schmidt-Jones'. The current page title is 'Time Signature', also by Catherine Schmidt-Jones. A summary explains that a time signature defines the number of beats in a measure and the type of note that fills one beat. A diagram shows a musical staff with a treble clef, a key signature of two sharps (F# and C#), and a time signature of 4/4. The time signature is highlighted in red. A 'Links' sidebar on the right includes 'Prerequisite links' (Note Duration) and 'Supplemental links' (Meter, Key Signature, Conducting). The page also features sections for 'COLLECTION CONTENTS', 'CONTENT ACTIONS' (Download PDF, Save to del.icio.us), and 'RELATED MATERIAL' (Similar content, Other collections using this content).

Figure 1: The time signature appears at the beginning of the piece of music, right after the clef symbol and key signature.

create

Sunil Kumar Singh



CONNECTIONS Contact Us | Report a Bug

Home Content About Us Help Search

You are here: [Home](#) » [Content](#) » [Physics for K-12](#) » [Acceleration](#)

COURSE CONTENTS
[\[show table of contents\]](#)

IN COURSE:
Physics for K-12 ([course home](#))

[« PREVIOUS](#) | [NEXT »](#)

Course by: [Sunil Kumar Singh](#)

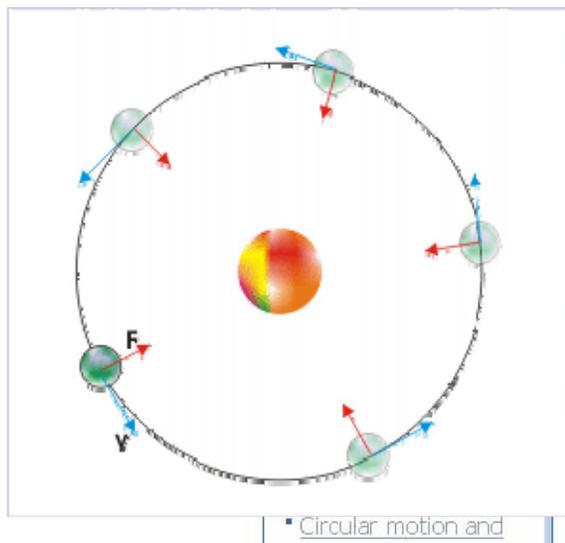
Acceleration

Module by: [Sunil Kumar Singh](#)

Summary: The rate of change of velocity with time is called acceleration. Most of the real time examples of motion are accelerated in variety of ways - despite the fact that the basic nature of the matter is to maintain its velocity in both direction and magnitude unless external force is applied. This means that we live in a world which is moderated by force.

All bodies have intrinsic property to maintain its velocity. This is a fundamental nature of matter. However, a change in the velocity results when a net external force is applied. In that situation, velocity is not constant and is a function of time.

In our daily life, we are often subjected to the change in velocity. The incidence of the



create

rip

mix

burn

anyone can translate, customize, ...

rip

PERSONALIZE

Choose a style

- [Summer Sky](#)
- [Desert Scape](#)
- [Charcoal](#)
- [Playland](#)

Análisis de Fourier en Espacios Complejos

[Print \(PDF\)](#)

By: [MICHAEL HAAG](#), [JUSTIN ROMBERG](#), [ERIKA JACKSON](#), [FARA MEZA](#)

Based on: [FOURIER ANALYSIS IN COMPLEX SPACES](#) by [MICHAEL HAAG](#), [JUSTIN ROMBERG](#)

Summary: Este modulo deriva la series de Fourier discreto en el tiempo (DTFS), la cual es un tipo de expansión de fourier para funciones periodicas y discretas en el tiempo. El modulo tambien da un repaso a los senosoidales complejos que sirven como bases.



estar familiarizado con la derivación de la [SERIES DE FOURIER](#) par alas
Esta derivación nos lleva a las siguientes ecuaciones las cuales usted

$$f(t) = \sum_n (c_n e^{j \omega_0 n t})$$
$$c_n = \frac{1}{T} \int_n f(t) e^{-j \omega_0 n t} dt$$
$$= \frac{1}{T} \langle f, e^{j \omega_0 n t} \rangle$$

Univ. Texas-El Paso



(2)

donde c_n nos dice la cantidad de frecuencia en $\omega_0 n$ in $f(t)$.

create

rip

mix

burn

assemble a customized course, ...

Fundamentals of Signal Processing



By: [Minh Do](#)

Course Content

» Introduction to Fundamentals of Signal Processing

FOUNDATIONS

- » Signals Represent Information
- » Introduction to Systems
- » Discrete-Time Signals and Systems
- » Linear Time-Invariant Systems



Fundamentals of Signal Processing

Minh Do

[Start Course](#)

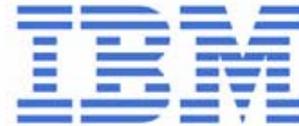
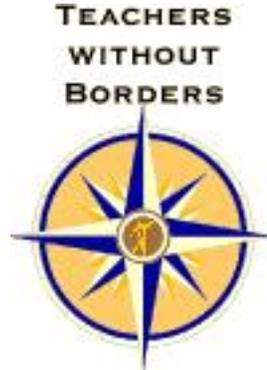
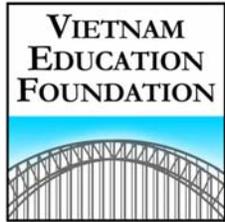
Course Author: [Minh Do](#)

Course Description: Presents fundamental concepts and tools in signal processing including: linear and shift-invariant systems, vector spaces and signal expansions, Fourier transforms, sampling, spectral and time-frequency analyses, digital filtering, z-transform, random signals and processes, Wiener and adaptive filters.

Contributing Authors: [Anders Gjendemsjø](#), [Benjamin Fite](#), [Clayton Scott](#), [Don Johnson](#), [Douglas L. Jones](#), [Hyeokho Choi](#), [Ivan Selesnick](#), [Justin Romberg](#), [Melissa Selik](#), [Michael Haag](#), [Minh Do](#), [Ricardo Radaelli-Sanchez](#), [Richard Baraniuk](#), [Rob Nowak](#)

rip

bp



CCOTP
Foothill-De Anza
Community College



THE WILLIAM AND FLORA
HEWLETT FOUNDATION

Connexions' growth

350+ textbooks/courses/collections

6200+ Lego modules (August 2008)

4000 in Science, Technology, Mathematics

2200 in Humanities, Arts, Social Sciences, Business

from authors *worldwide*

in English, Spanish, French, German

Italian, Portuguese, Finnish

Chinese, Japanese, Thai

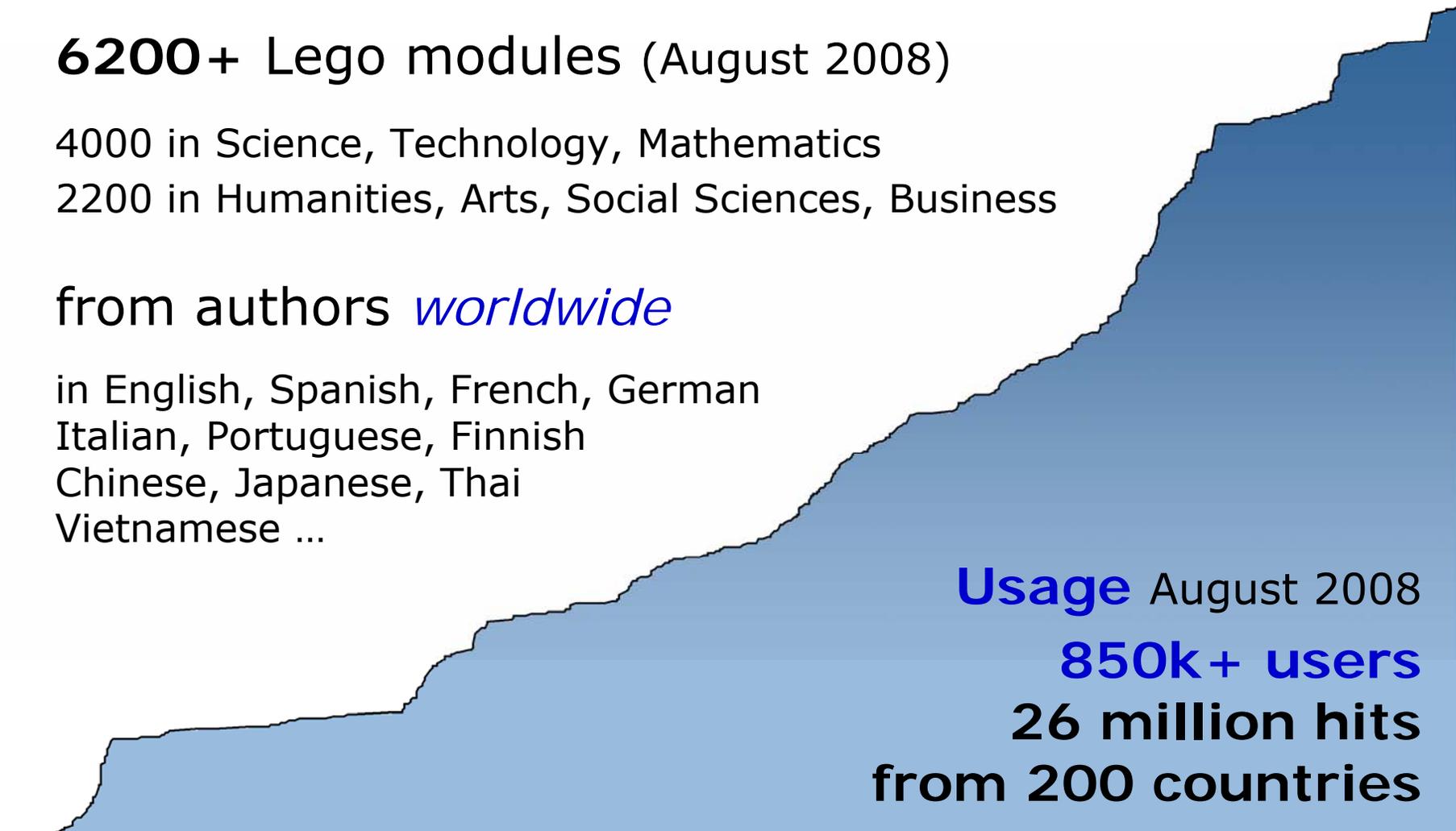
Vietnamese ...

Usage August 2008

850k+ users

26 million hits

from 200 countries



create

rip

mix

burn

anyone can **print** their own textbook

print customized textbooks

modular
authored by community
continuously updated
personalized on assembly
published on demand

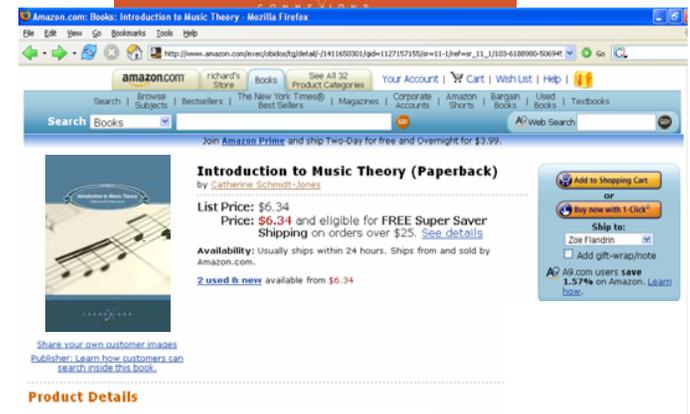
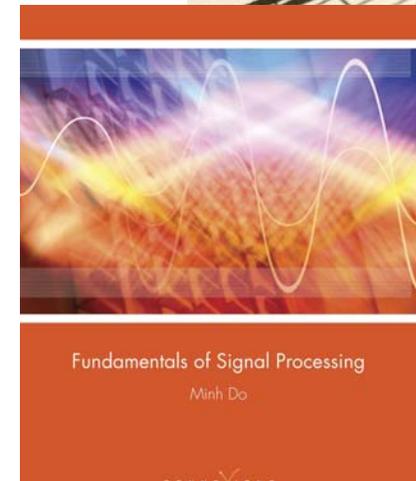
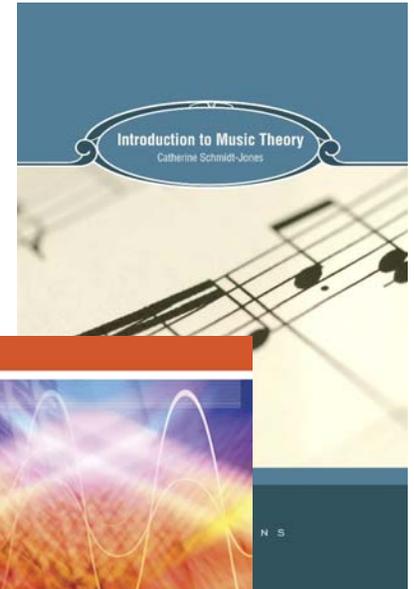
low cost

ex: 300 page hardbound
textbook for \$25, not \$125

sustainability revenue

print partner:

QOOP.com



rice university press

Rice University Press reopened and reinvented as **all digital press** within Connexions (2007)

RUP collaborations/joint publications

- Stanford University Press
- Smithsonian Press
- Long Tail Press

- Mellon Foundation
- Hewlett Foundation



July 13, 2006

Rice University Revives Its Press In Digital Model

By REBECCA BUCKMAN
July 13, 2006; Page B3



One of the nation's most prestigious universities is resurrecting its defunct academic press online -- a move that adds a new wrinkle to the debate over who will profit from Web publishing.



[Order printed copy](#)

Art History and Its Publications in the Electronic Age

By: [Hilary Ballon](#), [Mariet Westermann](#)

[Start Report](#)

Report Authors: [Hilary Ballon](#), [Mariet Westermann](#)

Report Description: Report on a Study Funded by the Andrew W. Mellon Foundation. This report is published by Rice University Press and CLIR.

Contributing Authors: [Hilary Ballon](#), [Mariet Westermann](#)



[View this content](#) | [Cite this content](#) | [Version history](#)
 licensed by [Hilary Ballon](#) and [Mariet Westermann](#) under a [Creative Commons License](#).

on Sep 20, 2006 1:36 pm GMT-5.

\$10 + shipping

Report Contents

- ◆ [Introduction](#)
- ◆ [Executive Summary](#)
- ◆ [Primary Recommendations](#)

Dynamics of Art History Publication

- ◆ [Dynamics of Art History Publication: Introduction](#)
- ◆ [Genres of Scholarly Publication](#)
- ◆ [Participants](#)
- ◆ [Trends](#)
- ◆ [Conclusion](#)

The Image Economy

- ◆ [The Image Economy: Introduction](#)
- ◆ [Copyright Ownership in Works of Art and Images](#)
- ◆ [Fair Use](#)
- ◆ [Permissions and Fees](#)
- ◆ [Image Quality and Reader Access](#)
- ◆ [Costs to Publishers](#)
- ◆ [Responses to Copyright, Access, and Cost Challenges](#)
- ◆ [Print-on-Demand](#)
- ◆ [Recommendations on Images](#)

Electronic Publication

- ◆ [Electronic Publication: Introduction](#)
- ◆ [The Rise of Digital Art History](#)
- ◆ [Problems of Transition](#)
- ◆ [Journals as Portals of Electronic Publication](#)
- ◆ [Journal Extensions: Specific Applications](#)
- ◆ [Word and Image Synchronized](#)
- ◆ [Collaborative and Museum Publications](#)
- ◆ [University Presses and Libraries](#)
- ◆ [A Consortium for Art and Architectural History Online](#)
- ◆ [Recommendations for Electronic Publication](#)



**Community College Consortium
for
Open Educational Resources**

- Anne Arundel Community College
- College of the Canyons
- Diablo Valley College, Contra Costa Community College District
- El Camino Community College
- Foothill-De Anza Community College District
- Humber Institute of Technology & Adv. Learning
- Kirkwood Community College
- Long Beach Community College
- Los Angeles Community College District
- Los Rios Community College District
- Monroe Community College
- Mt. San Antonio College
- Ohlone Community College
- Peralta Community College District
- San Diego Community College District
- State Center Community College District
- Truckee Meadows Community College
- Santa Barbara City College
- Washington State Board for Community & Technical Colleges

what's new?

create

rip

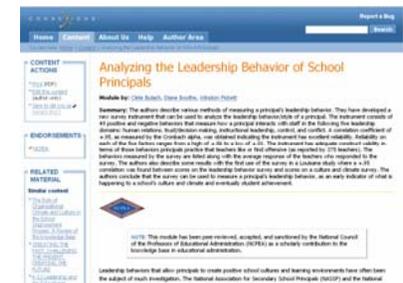
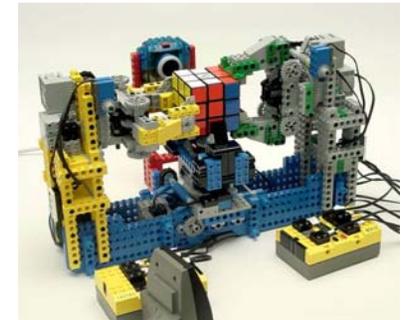
mix

burn

Connexions

open access textbooks

open license (Creative Commons)
free on-line
low-cost print-on-demand
customizable (to state standards)
personalizable to individual students
continuously updated (use, re-use)
community authored (inclusive)
high quality via peer review
transparent sustainability model



partners worldwide

faculty authors and instructors
educational institutions
publishers (*add value* a la Red Hat/IBM to Linux)

how you can help?

- citizens should get more for the \$Billions spent on textbooks each year
- sharing materials provides important professional development opportunities for educators at all levels
 - openness will improve overall quality of education
- **encourage open access textbook publishing**
 - place educational materials created by state agencies / employees in public domain or under a CC-by license (note: makes them available for use/re-use by publishers)
 - precedents: NIH and PubMed Central
US government initiatives in 1950s
 - make (partial) open access a requirement for textbook *adoption* (possible sunset clause)
- **run a vertically integrated open access textbook experiment**
 - choose an area underserved by current solutions

create rip mix burn



C O N N E X I O N S
CNX.ORG

