Orientation - Fall 2005
Course 3
The Curriculum
and
Careers in Materials Science and Engineering

Prof. Caroline Ross

Chair of Undergraduate Committee

The Curriculum - Fall 2005

3.012 - Fundamentals of MSE (5-0-10)

3.014 - Materials Laboratory (1-4-7)

3.016 - Mathematical Methods for MSE (3-1-8)

3.012 and 3.016 run for 9 weeks only. 3.014 runs for 4 weeks only. Since 3.012 and 3.014 do not run while 3.014 is running, there is no conflict with the meeting times.

3.012 is a REST

and **3.014** is a LAB and also satisfies CI-M

They could be taken separately but it is best to take them together.

3.016 can substitute for 18.03 in our curriculum. It is a 12-unit subject designed for MSE students who wish to learn about the math that is essential to MSE. This covers a range of math topics with emphasis on MSE examples, using Mathematica (R) as a vehicle. To find out more, see the web site: **http://pruffle.mit.edu/3.016/**

3.016 can satisfy the computation requirement (one of 3.021J, 3.016, 1.00 or 6.001).

Spring Semester and later : required subjects for course 3
(3C is different, see handout)

3.022 Microstructural Evolution in Materials, 3-3-6
3.024 Electronic, Optical and Magnetic Properties of Materials, 3-3-6

3.021J Introduction to Modeling and Simulation, 3-0-9 REST

3.032 Mechanical Properties of Materials, 4-2-6
3.034 Organic and Biomaterials Chemistry, 4-2-6
3.042 Materials Project Laboratory, CI-M, 1-6-5
3.044 Materials Processing, 4-0-8

3.Th.U Thesis, 9-12 units
OR 3.930 Industrial Practice,6, plus 3.931 Industrial Practice, 6

Elective subjects for course 3 (3C is different, see handout)

3.069 Ceramics Processing,
3.07 Introduction to Ceramics,
3.15 Electrical, Optical and Magnetic Materials and Devices,
3.153 Introduction to Nanoscale Materials,
3.155J Micro/Nano Processing Technology, CI-M
3.14 Physical Metallurgy,
3.046 Thermodynamics of Materials,
3.048 Advanced materials processing,
3.063 Polymer Physics,
3.064 Polymer Engineering,
3.051J Materials for Biomedical Applications,
3.052 Nanomechanics of Materials and Biomaterials
3.072 Symmetry, Structure and Tensor Properties of Materials
3.073 Diffraction and Structure
3.080 Economic and Environmental Materials Selection

Careers

Our Department evolved from the original Course 4 (Geology and Mining) offered by MIT in 1865. Students learned about extraction of metals, and primarily joined the mining and metals industries. Through the 1950s, metallurgy (and ceramics) were the strongest part of the Department, and most graduates would have gone into the metals industry. However, in the 1960s, a 'Materials Science' subject was offered, and the range of materials studied here expanded to include electronic materials and polymers.

Graduates now enter a huge range of industries and careers, and not just those related to materials production.

Back in 1974, there were 37 undergrad students majoring in course 3. In 1981 there were 146 (40% women). This year we have about 130 undergrad students (>half women) and 37 faculty.

III.—MINING ENGINEERING AND METALLURGY.

(METALLURGY.)

FIRST YEAR COMMON TO ALL COURSES. SEE PAGE 23.

SECOND YEAR.

FIRST TERM.

	Number
Physics	155
German	73
Analytic Geometry	20
Political Economy	95
Analytical Chemistry	126
Options.	
3. Descriptive Geometry	52
3. Principles of Mechanism	240
3. Blowpipe Silver Assay (elective)	290
4. Theoretical Chemistry	127
4. Blowpipe Silver Assay	290

SECOND TERM.

	Number
Differential Calculus	22
English Literature	56
Physics	155
German	73
Determinative Mineralogy	291
Options.	
3. Mechanism; Drawing	243
3. Analytical Chemistry (elective)	126
4. Analytical Chemistry	126

THIRD YEAR.

FIRST TERM.

Analytical Chemistry, Lectures and Laboratory	129
German	74
Physics: Heat	159
Physical Laboratory	160
Options.	
Integral Calculus	23
General Statics	41
3. Steam Engineering; Thermodynamics	248
Drawing	250
Electricity	164
Industrial Chemistry	130
4. Industrial Laboratory	139
Drawing.	
English	57

SECOND TERM.

Analytical Chemistry, Lectures and Laboratory	129
Assaying	293
German	74
Physical Laboratory	160
Options.	
3. Strength of Materials, Kinematics, and Dynamics	42
3. Steam Engineering	248
3. Engineering Laboratory	253
Industrial Chemistry	130
4. Industrial Laboratory	139
Theoretical Chemistry	128
English	57, 124

FOURTH YEAR.

FIRST TERM.

Heat Measurements	171
Dynamo Machinery	186
Metallurgy	294, 295
Ore-Dressing	298
Memoirs. English Criticism.	
Options.	
Strength of Materials; Friction	43
Steam Engineering	254
3. Hydraulic Engineering	213
Engineering Laboratory	259
Mining and Metallurgical Laboratory	296
Analytical Chemistry	133
4. Electro-metallurgy.	
Drawing.	
Metallurgical Laboratory	296

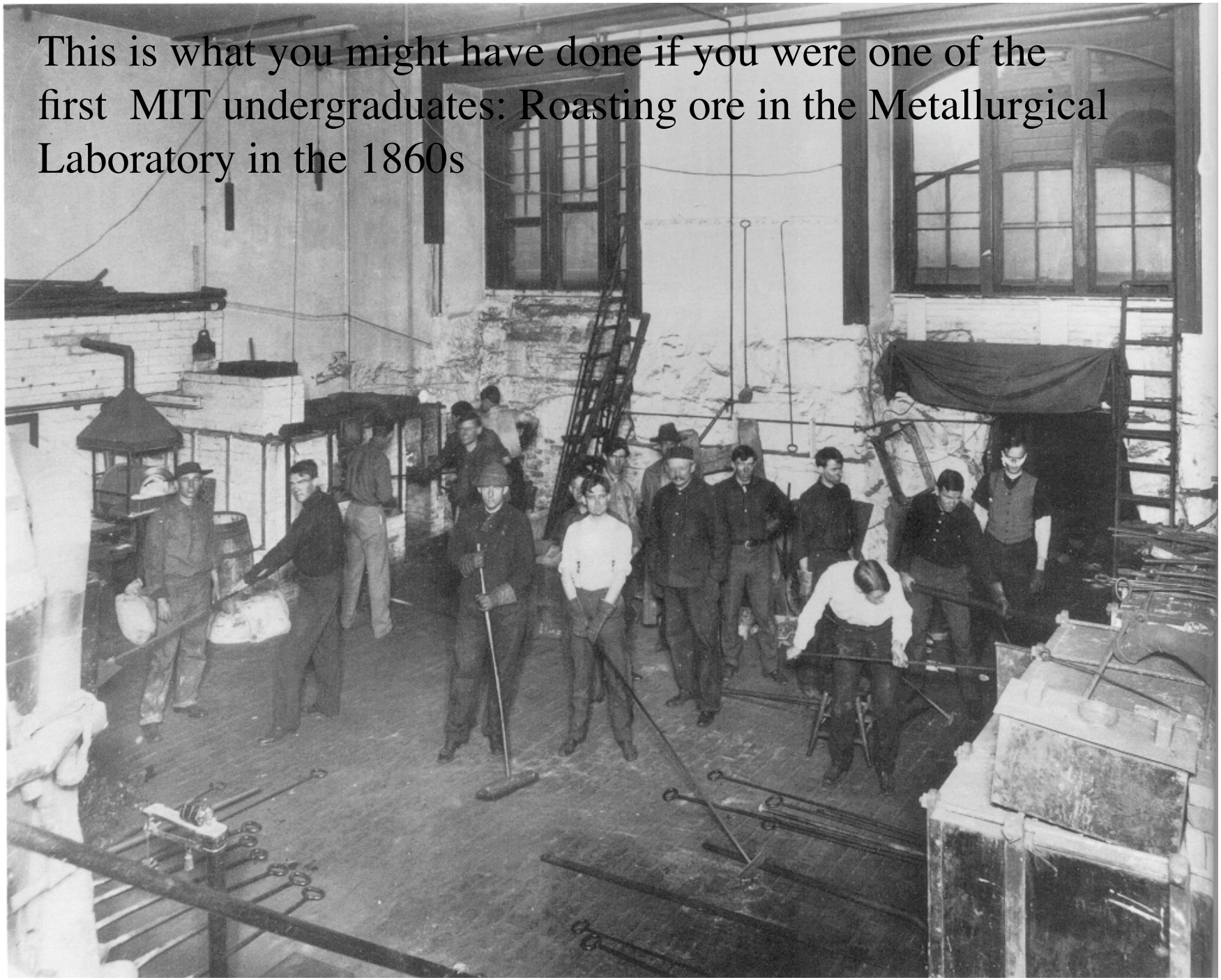
SECOND TERM.

Metallurgy	299
Analytical Chemistry	133
Memoirs. English Criticism.	
Options.	
Technical Machinery	269
3. Engineering Laboratory	259
3. Metallurgical and Mining Laboratory	297
4. Metallurgical and Mining Laboratory	297

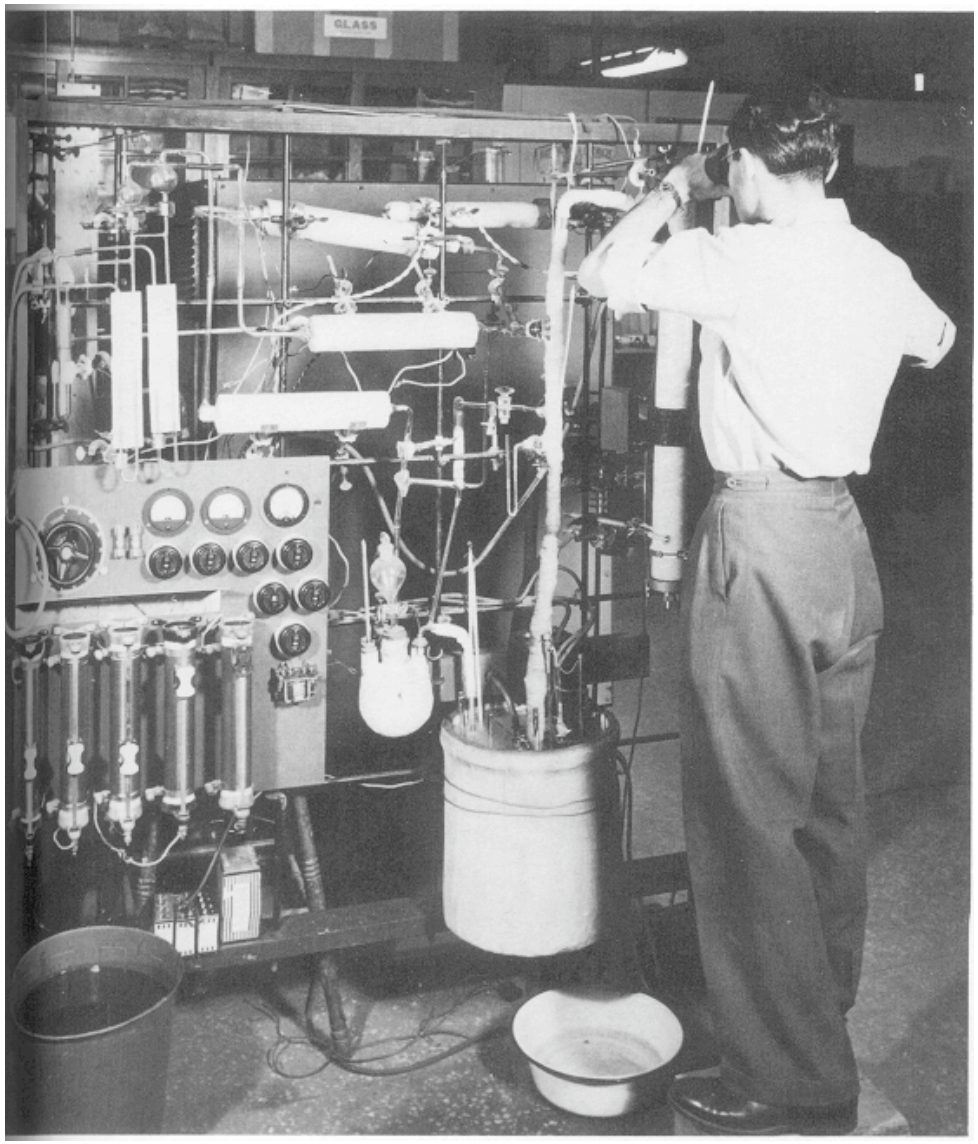
The course 3 catalog page, 1889

(from Metallurgy and Materials Science and Engineering at MIT: 1865-1988, M. Bever)

This is what you might have done if you were one of the first MIT undergraduates: Roasting ore in the Metallurgical Laboratory in the 1860s



This is what you might have done in the 1950s and 60s

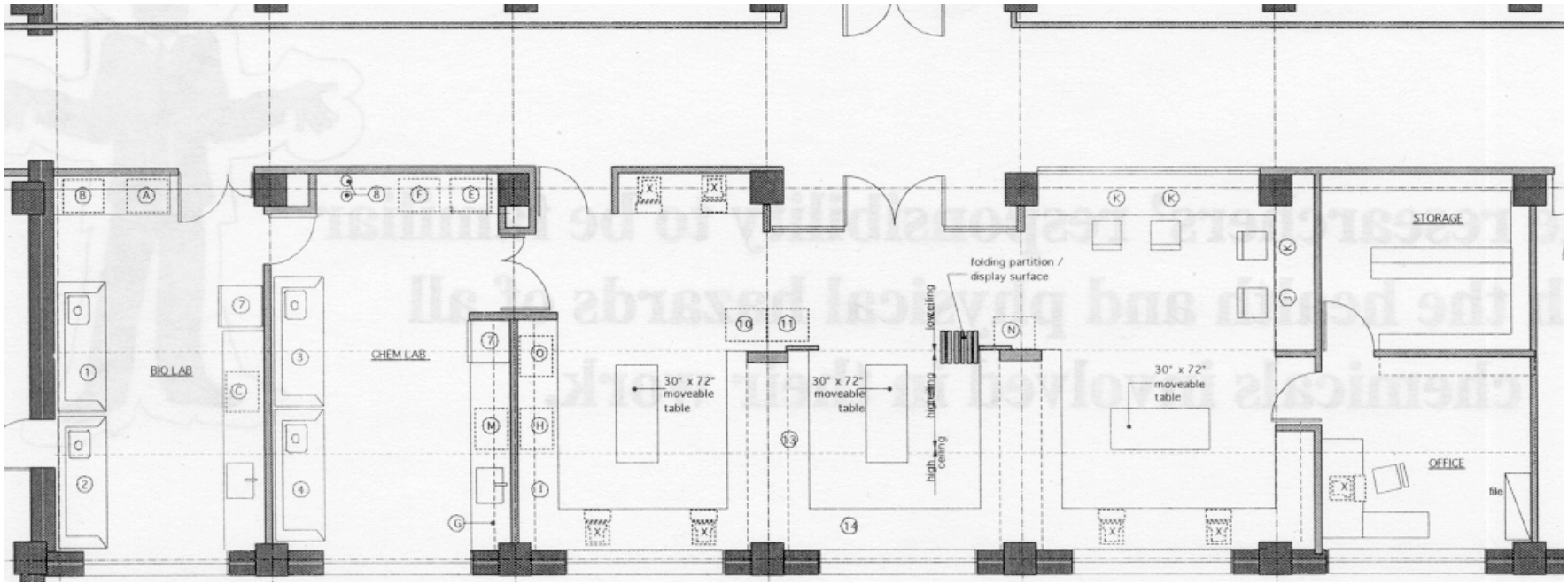


measuring gas content in molten metal

Prof. Kingery demonstrating the strength of ice in the Ice Lab

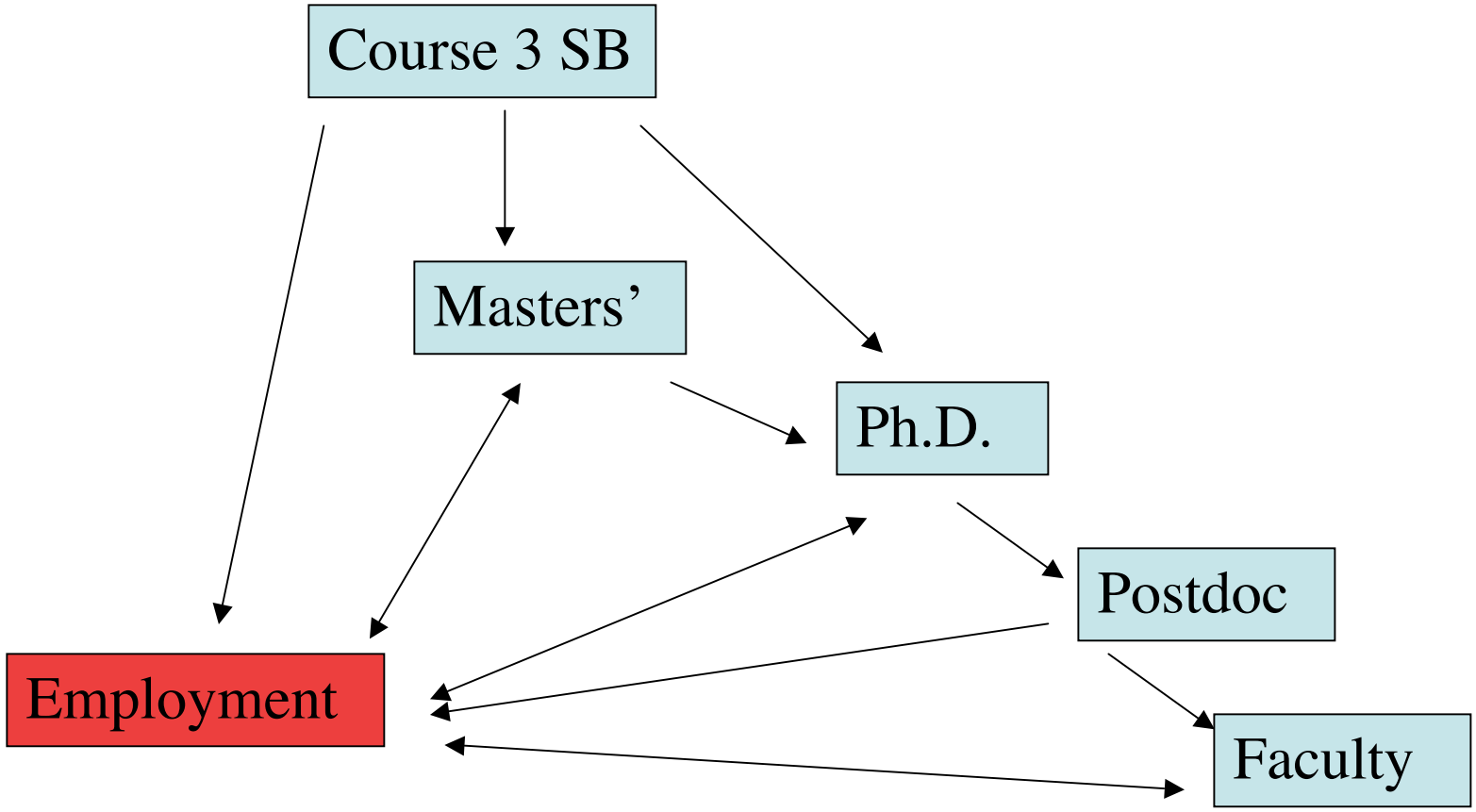
In the 2000s, we study a wide range of materials - polymers and biomaterials, electronic materials, ceramics, metals, and diverse applications of all these different materials. We also offer a degree in Materials and Archaeology (3C) which explores the interaction between materials and human societies.

In 2003 we started a new undergraduate curriculum, and opened a new laboratory on the Infinite Corridor.



Careers

In the 21st century, what do graduates of the Department end up doing with their lives?



Some Companies employing recent alums:

Alcoa	*Life Scan, Inc*
Allied Signal	*Meadox Medicals*
Applied Materials	*MedSource Technologies*
Battelle	*Medtronic, Inc.*
BD Product Development	*Michigan Con*
Boston Acoustics	*Molten Metal Tech.*
Bristol Myers	*Motorola*
Case Corp	*National Semiconducter*
Celanese	*Novellus Systems*
Cytec Eng'g. Mats.	*Oracle Corp. PPG Industries*
Delphi Automotive Systems	*Polaroid*
E. Ink	*Proctor& Gamble*
Flint Ink	*Pure Tech Ventures*
Ford Motor Co.	*Raychem*
General Electric	*Saudi Aramco*
Gillette	*Seagate*
Hewlett-Packard	*Syncra Systems*
IBM	*Turner Contruction*
Intel	*Advent Software*
IronRhino Inc.	*Intel*
KLA-Tencor Copr.	*Surface Logix, Inc*

Government Labs
employing recent alums:

Draper Laboratories
Lincoln Labs
Los Alamos Nat'l Labs
Peace Corps
US Navy
US Air Force

and Consulting firms

Accenture
Bain & Company
Bingham Dana
Citibank
Coopers & Lybrand
Deloitte & Touche
Exchange Partners
Fletcher Spaght
Finnegan Henderson
Fish & Richardson
Gemini Consulting
Heckler Law Group, The
J.P. Morgan
Lehman Brothers
Main St. Merchants
McKinsey & Co
Millburn Corp.
Morgan Stanley
NIB Capitol Private Equity
Putnam Hayes & Bartlett

Some universites where our S.B. students have gone on to graduate school:

Albert Einstein Medical College	*Purdue University*
Arizona State University	*Stanford University*
Brown University	*University of California, Brekeley*
Caltech	*University of California, Santa Barbara*
Carnegie-Mellon University	*University of Illinois - Urbana*
Cornell University	*University of Massachusetts - Amherst*
Duke	*University of Michigan*
Harvard Business School	*University of Minnesota*
Johns Hopkins University	*University of Texas*
Massachusetts Institute of Technology	*University of Utah*
MIT Sloan School	*University of Virginia*
Northwestern University	*Wellesley College*

Salaries for DMSE graduates, in $k per annum

http://web.mit.edu/career/www/salary.html

Year, degree	Salary range	# of data points
2005	63 - 100k	24
2004 SB	47 - 58k	2
PhD	80 - 93k	5
2003 SB	43 - 52k	3
SM	66 - 90k	3
MEng	50 - 75k	3
PhD	87k	1

Some Course 3 Alums who made it big

Alan Bufferd, the Treasurer of MIT (runs a $7B endowment)

Dave Hill, CEO of Huber Chemical

David Ragone, former President of Case Western

Jeff Kohr, VP of EMS (Eastern Mountain Sports)

Steve Palmer, multi$M investment banker

Jenine Nell, consultant at Exponent, $750/hr

Harold Brown, the biggest landlord in Boston in the 80s

Dick Simmons, former executive in Allegheny Ludlum, worth $1B

John Chipman, revolutionized steelmaking and uranium processing

Sheldon Roberts, a founder of National Semiconductor

Gene Myron, Intel Fellow

Stavros Salapatos, steel magnate

Some final thoughts

Career paths now are much more diverse in the past, and most people have several careers during their lives. There are many possible career choices for anyone taking either the 3 or 3C degree in Materials Science and Engineering.

Course 3 has an Industrial internship option for students interested in working in industry over the summers.

Course 3A is often taken by students interested in pre-med, pre-law or pre-business, and gives more flexibility in subject selection.

Your advisor can help you out with choosing subjects if you have a particular career in mind. Remember to make use of the MIT career services, http://web.mit.edu/career/www/.