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Welcome

Metabolic Engineering is a new approach to understanding and using metabolic processes. As the name implies, ME is the targeted and purposeful alteration of metabolic pathways found in an organism in order to better understand and use cellular pathways for chemical transformation, energy transduction, and supramolecular assembly. Knowledge acquired from this research will benefit society in a number of ways, including the ability to modify biological pathways to produce biological substitutes for less desirable chemical processes; allowing greater agricultural production, permitting more efficient and safer energy production, and; providing better understanding of the metabolic basis for some medical conditions that could assist in the development of new cures.

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NEW ANNOUNCEMENT OF OPPORTUNITIES

The Metabolic Engineering Working Group has issued its fifth Interagency Announcement of Opportunities in Metabolic Engineering. This announcement may be found at the NSF Web site.
If you are interested in application, please follow the instructions provided at that site. To download a non-html version of this announcement, see:

http://www.nsf.gov/pubsys/ods/getpub.cfm?ods_key=nsf03516

REPORT ON INTERAGENCY ANNOUNCEMENT OF OPPORTUNITIES IN METABOLIC ENGINEERING (NSF 01-19)

Awards have been made as a result of this announcement and details of these awards can be found at our NSF01-19 Report Page. Details of awards from previous announcements can be viewed in the current format by clicking on the Project Inventory button in the navigation bar to the left of this page. The Working Group is pleased with the results of the third Interagency competition in Metabolic Engineering and has already carried out another competition (NSF 02-037) in accordance with the five-year plan of the Working Group. Awards for this competition are currently being processed. The announcement may be found at:

http://www.nsf.gov/pubs/2003/nsf02037/nsf02037.htm

Fred G. Heineken
Chair
Metabolic Engineering Working Group
Subcommittee on Biotechnology

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Events

FOURTH MEWG INTERAGENCY CONFERENCE

The Metabolic Engineering Working Group is sponsoring its seventh workshop and fourth Interagency Conference Workshop on Friday, February 6, 2004 at NSF. Further information about this event will be posted soon.

Report on Interagency Announcement of Opportunities in Metabolic Engineering

THIRD MEWG INTERAGENCY CONFERENCE

The Metabolic Engineering Working Group sponsored its sixth workshop and third Interagency Conference Workshop on Friday, January 31, 2003 at NSF.

http://www.metabolicengineering.gov/me2003/

SECOND MEWG GRANTEES WORKSHOP

The Metabolic Engineering Working Group sponsored its fifth workshop and second Grantees Workshop on Thursday, June 28, 2001 at NSF. Proceedings are now available.

http://www.metabolicengineering.gov/me2001/ReportTOC.htm

FIRST MEWG GRANTEES WORKSHOP

The Metabolic Engineering Working Group sponsored its fourth workshop and first Grantees Workshop on Wednesday, May 31, 2000 at NSF, 4200 Wilson Blvd, Arlington VA. The workshop consisted of presentations of research progress by current grantees, during a morning session and a special session focusing on bioinformations and metabolic engineering during the afternoon session. Proceedings have been prepared and can be found at the following site.

http://www.metabolicengineering.gov/me2000/ReportTOC.htm

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The Inventory

Purpose:

This listing is intended to capture, store and link to documents relating to Metabolic Engineering projects being sponsored by federal agencies. The group interested in these projects is comprised of scientists from eight federal departments or independent agencies with responsibilities for furthering metabolic engineering research. This resource serves as an inventory of these efforts.

Content:

The Metabolic Engineering Project Inventory listing contains records, one per project. Each of the entries represents a research project in the area of metabolic engineering (ME) funded by a federal agency. The listings contain information on the grantee, the project purpose, grant (amount and time-frame) and the supporting federal agency or department.

Each project is categorized by funding department or agency, supporting institution and principal investigator. The records are organized by each of these categories, with expanded descriptions reached through use of the navigational links in some cases. For projects funded from two joint announcements there are separate documents for each project. However, the tables list only the names and institutions of the Principal Investigators (PI). Co-PI names are listed in the main documents for

each PI, with a document for each Co-PI linked to the main document for the PI. The document for a Co-PI can only be reached through the link from the main document for the PI of the project. Because of these linkages, some information common to the project, for both PI and Co-PIs, is not repeated in the document for the Co-PI.

Projects described here often have been supported by more than one federal agency. Therefore, to accommodate the varying needs of the funding agencies, some projects will have been broken into discrete elements, each having a unique identifier, sometimes with separate titles and descriptions. Where appropriate, funding amounts shown for each investigator are aggregate amounts from the different sources. This Inventory provides separate documents for each separately funded element, but links these projects in the tables and cross-links them within the separate document pages, where such pages exist.

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Background:

Metabolic engineering is an emerging approach to the understanding and utilization of metabolic processes. As the name implies, ME is the targeted and purposeful alteration of metabolic pathways found in an organism in order to better understand and utilize cellular pathways for chemical transformation, energy transduction, and supramolecular assembly. ME typically involves the redirection of cellular activities by the rearrangement of the enzymatic, transport, and regulatory functions of the cell through the use of recombinant DNA and other techniques. Much of this effort has focused on microbial organisms, but important work is being done in cell cultures derived from plants, insects, and animals. Progress in ME depends upon knowledge that includes conceptual and technical approaches necessary to understand the integration and control of genetic, catalytic, and transport processes. While this knowledge will be valuable as fundamental research, per se, it will also provide the underpinning for many applications of immediate value.

The Metabolic Engineering Working Group was created in 1995 by the Biotechnology Research Subcommittee (BRS), an Inter Agency Coordinating Committee under the office of Science and Technology Policy (OSTP), in response to a need identified in their report, "Biotechnology for the 21st Century: New Horizons". This Working Group has already held two interagency workshops on the subject and released an Interagency Announcement of Opportunities in Metabolic Engineering . At the second of its annual workshops, a need for compiling information on current research in metabolic engineering was identified and the creation of a data resource was recommended. This Inventory is the response of the Working Group to that need.

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Audience:

Federal Program Managers, workgroup members, and researchers will use this database in different ways. Program managers will look for projects related to those they are funding or intend to fund and for potential applicants to whom they might address invitations to apply to announcements. The workgroup members will look for trends in research funding in order to plan future joint announcements of opportunities

and to plan other activities, such as workshops, based on current research. Information on principal investigators may help in selecting speakers for meetings. Researchers will want to see which agencies are funding specific types of projects, in order to focus their research plans.

Expected Update Schedule/Cycle:

It is expected that the listing will be updated as each agency completes its annual funding cycle. New projects will be listed at that time. The Working Group has not yet determined whether, and for how long completed projects will be retained in the listings. Users are encouraged to comment on this issue by email to the technical contacts listed below. Current projects will, of course, remain posted for the duration of the project. Information on specific projects will be supplied by the primary funding agency. Due to the nature of the Working Group and its Interagency Announcements, all listed projects should have more than one funding agency, but one agency may be designated as the lead for a given component of the project. That agency will be responsible for the information to be listed on the project. Contacts for each responsible agency or department will be provided in each project document.

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Contacts:

The contact for inventory content is Dr. Mark Segal, U.S. EPA at (202)-260-3389.

The web site manager is Stephen Gould, WTEC, (240)-351-3815.

The web designer/consultant is Sam Monbo, WTEC, 410-276-7797

Agency contacts for the Metabolic Engineering Working Group are as follows: MEWG Contacts

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About MEWG

In July 1995, the Biotechnology Research Subcommittee (BRS), an Inter Agency Coordinating Committee under the office of Science and Technology Policy (OSTP), released the report "Biotechnology for the 21st Century: New Horizons" that identifies research priorities and opportunities in biotechnology. This report described the promise of this new technology and included an assessment of federal roles relating to its advancement. One of the research priorities included the need for a better understanding of metabolic pathways and metabolic engineering in living systems. To stimulate increased awareness and attention to this field, the BRS established the MEWG. The MEWG is comprised of representatives from eight federal agencies who work together to facilitate assistance to those investigating application of metabolic engineering principles in a wide range of areas.

Metabolic Engineering is a new approach to understanding and using metabolic processes. As the name implies, ME is the targeted and purposeful alteration of metabolic pathways found in an organism in order to better understand and use cellular pathways for chemical transformation, energy transduction, and supramolecular assembly. Knowledge acquired from this research will benefit society in a number of ways, including the ability to modify biological pathways to produce biological substitutes for less desirable chemical processes; allowing greater agricultural production, permitting more efficient and safer energy production, and; providing better understanding of the metabolic basis for some medical conditions that could assist in the development of new cures.

To accomplish its mandate, the MEWG has been active through monthly meetings, annual workshops and occasional seminars. From these interagency sessions, two major initiatives were identified: announcements of interagency, rather than agency-specific opportunities for funding research grants, and; the beginnings of a government-wide Metabolic Engineering Project Inventory. The preceding link provides access to that Inventory.

Amongst these various activities, MEWG has held four grant competitions (NSF 98-49, NSF 99-85, NSF 01-19, and NSF 02-37)). The first competition resulted in 19 proposals with five awards totalling $3.6M, the second competition resulted in 29 proposals with six awards totalling $3.1M, and the third competition resulted in 13 awards made from 33 proposals with total funding of $7.5 million. Awards from 47 proposals for the fourth competition are currently being processed. In addition the MEWG has held several workshops.

Audience:

Although the MEWG welcomes everyone to peruse this site, MEWG workgroup members, Federal research Program Managers, and researchers are the intended audience and will be expected to use this site in different ways. Program managers will look for projects related to those they are funding or intend to fund and for potential applicants to whom they might address invitations to apply to announcements. They also will look for meetings and other events open to them. The Metabolic Engineering Workgroup Members will look for trends in research funding in order to plan future joint announcements of opportunities and to plan other activities, such as workshops, based on current research. Information on principal investigators may help in selecting speakers for meetings. Researchers will want to see which agencies are funding specific types of projects, in order to focus their research plans. They may also be interested in activities sponsored by the Working Group.

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Participating Departments and Agencies

Department of Agriculture
Contacts:Liang-Shiou Lin/Gail McLean/Chavonda Jacobs-Young

Department of Defense
Contacts:Harold Bright/Eric Eisenstadt

Department of Energy
Contacts:Valerie Sarisky-Reed/Greg Dilworth/Daniel Drell

Environmental Protection Agency
Contacts:Michael Broder /Mark Segal/Barbara Karn/April Richards

National Aeronautics Space Administration
Contact:Steven Davison

National Institute of General Medical Sciences (NIH)
Contacts:Warren Jones/Jim Anderson

National Institute of Standards and Technology
Contact:Vincent Vilker /Travis Gallagher

National Science Foundation
Contacts:Fred G. Heineken/James Lee/Neil Hoffman/Stephen Herbert

Report On

REPORT ON

THIRD INTERAGENCY ANNOUNCEMENT OF OPPORTUNITIES IN METABOLIC ENGINEERING
(NSF 01-19)

This is a report on results of a very successful Interagency Activity in Metabolic Engineering sponsored by the Metabolic Engineering Working Group (MEWG), an Interagency Working Group that is part of the Subcommittee on Biotechnology which reports to the Committee on Science of the National Science and Technology Council. This Working Group issued on December 2, 2000, an "Interagency Announcement of Opportunities in Metabolic Engineering" (NSF 01-19) which made known the availability of funds to support three topic areas of Metabolic Engineering that were highlighted in the Announcement.

33 Full-Proposals were received in response to the Announcement. Each agency that was interested in a particular proposal was asked to supply names of possible reviewers. Each of the participating agencies was also asked to provide names of possible panelists for a Panel review of the Full-Proposals. A Panel of 12 scientists and engineers with a variety of disciplines reviewed all 33 Full-Proposals. The Working Group agreed that the NSF Format and Review Criteria would be used along with additional Review Criteria provided by NIH to evaluate the Full-Proposals. Based on letter reviews and the recommendations of the Panel, 13 Project Awards were made, totaling $7.5M.

A data sheet is attached showing how the participating Agencies provided funding for the 13 Awards.

The Working Group is pleased with the results of the third Interagency competition in Metabolic Engineering and has already carried out a fourth competition (NSF 02-037) in accordance with the five-year plan of the Working Group. Awards for this competition are currently being processed.

Fred G. Heineken
Chair
Metabolic Engineering Working Group
Subcommittee on Biotechnology

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3rd Announcement

Third Interagency Announcement of Opportunities in Metabolic Engineering

DATA SHEET
NSF 01-19

Principal Investigator	Project Title	Type of Award	Award Amount	Funding Sources
Vassily Hatzimanikatis (Northwestern University)	Mathematical and Computational Analysis of Central Carbon Pathways for Efficient Metabolic Engineering	3 Year Standard	$196,565 $196,564	DOE NASA
Jonathan Dordick (Rensselaer Polytechnic Institute) **David Sherman** (University of Minnesota)	Combinatorial in vitro Manipulation of a Polyketide Synthase Pathway on a Microscale	3 Year Continuing	$271,603 $100,000	NSF Bioengineering NSF Metabolic Biochemistry
		3 Year Continuing	$269,816 $100,000	NSF Bioengineering NSF Metabolic Biochemistry
Claudia Schmidt-Dannert (University of Minnesota)	Biosynthesis of Unnatural Porphyrins in E. coli through Molecular Pathway Breeding	4 Year Continuing	$688,984	NIH
Martin Yarmush (Mass General Hospital)	Real Time Functional Genomics of Metabolism using Living Cell Arrays	3 Year Continuing	$882,300	NIH
Francis Arnold (California Institute of Technology)	Laboratory Evolution of Carotenoid Biosynthetic Pathways	3 Year Continuing	$411,625	NSF Bioengineering
Russel Kerr (Florida Atlantic University)	Development of a Chemoenzymatic Production Method and New Pharmacological Models for Marine Anti-Flammatory Agents	3 Year Standard	$100,000 $232,000 $28,020	NSF Metabolic Biochemistry NSF Chemistry NSF Bioengineering
Ignacio Grossman (Carnegie Mellon University) **Mohammad Ataai** (University of Pittsburgh)	Metabolic Engineering of Bacillus for Enhanced Product Yield	3 Year Standard	$180,000	EPA
		3 Year Continuing	$308,965	NSF Bioengineering
Ka-yiu San (William Marsh Rice University)	An Integrated Metabolic Engineering Study of Evolved Alcohol Acetyl Transferase Enzymes in Flavor Compound Formation in E. coli	3 Year Standard	$300,000 $152,670	USDA NSF Bioengineering
Camilla Kao (Stanford University)	DNA Microarray Analyses of High and Low Producing Strains of Engineered Natural Products	4 Year Continuing	$642,055	NIH

Peter Karp (SRI International)	Development of the MetaCyc Metabolic Data Base	2 Year Continuing	$769,587	NIH
Craig Nessler (Virginia Polytechnic Institute & State University)	Metabolic Engineering of Plant Vitamin C Biosynthesis for Improved Nutrition and Health	3 Year Standard	$100,000 $100,000 $100,000	USDA NSF Metabolic Biochemistry NSF Integrative Plant Biology
Eleftherios Papoutsakis (Northwestern University)	Transcriptional Program of ex vivo Expanded Human T Cells Using DNA Arrays	3 Year Standard	$736,576	NIH
Anne Robinson (University of Delaware)	Novel Sensing and Quantitative Analysis of the Regulatory Mechanisms in the Unfolded Protein Response for Optimal Heterologous Protein Expression	3 Year Standard	$620,382	NIH
Total 13 Project Awards			**$7,487,712**	

For more information on NSF-funded awards, use the NSF Search Page.

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1st Announcement

First Interagency Announcement of Opportunities in Metabolic Engineering

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Principal Investigator	Project Title	Duration of Award	Award Amount	Funding Sources
Michael J. Betenbaugh (Johns Hopkins University), **Donald L. Jarvis** (University of Wyoming)	Carbohydrate Engineering for Generating Sialylated Glycoproteins in Insect Cells	3 years	$736,248 $78,458 $40,500 In-Kind Support	NSF-BES USDA FDA NIH
Andrew D. Hanson (University of Florida), **David Rhodes** (Purdue University), **Hans J. Bohnert** (University of Arizona), **Stuart Gage** (Michigan State University) **Yair Shachar-Hill** (New Mexico State University)	Engineering Plant One-Carbon (1-C) Metabolism NMR Studies of Metabolically-Engineered One-Carbon Metabolism in Plants	3 years	$400,000 $121,300 $124,000 $114,135	NSF-IBN NSF-CHE NIST DOE
L.O. Ingram, J.F. Preston, & K.T. Shanmugam (University of Florida)	Advanced Ethanologenic Biocatalysts for Lignocellulosic Fermentations	4 years	$298,935 $300,000	USDA DOE
Jay D. Keasling (University of California-Berkeley)	Strategies for Metabolic Engineering of Environmental Microorganisms - Application to Degradation of Organophosphate Contaminants	3 years	$264,980 $132,769	NSF-BES ONR
Bernhard Palsson (University of California-San Diego) **George Church** (Harvard University)	In Silico Analysis of the Escherichia Coli Metabolic Genotype and the Construction of Selected Isogenic Strains	4 years	$274,593 $300,000 $150,000	NSF-BES NSF-MCB ONR
Total **5 Project Awards**			**$3,607,667**	

For more information on NSF-funded awards, use the NSF Search Page.

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2nd Announcement

Second Interagency Announcement of Opportunities in Metabolic Engineering

DATA SHEET

Principal Investigator	Project Title	Award Duration	Award Amount	Funding Sources
Eleftherios T. Papoutsakis, Neil E. Welker (Northwestern University)	Metabolic Engineering of Solvent Tolerance in Anaerobic Bacteria	3 years	$194,234 $150,000 $180,000	NSF-BES NSF-MCB EPA
Imran Shah (University of Colorado), **Ashok S. Kolaskar** (American Type Culture Collection)	Modeling Metabolic Pathways: A Bionformatics Approach	3 years	$228,417 $150,000 $155,844 $150,000	NSF-BES NSF-MCB ONR DOE
Harold G. Monbouquette (University of California, Los Angeles)	A Functional Proteomics Approach for Elucidation of Metabolic Pathways: Aromatic Biosynthesis in Archaeoglobus Fulgidus	3 years	$449,961 $149,999	NSF-BES NIST
Jay D. Keasling (University of California-Berkeley)	Metabolic Engineering of Isoprenoid Production	3 years	$76,234 $75,000 $75,000 $148,165	NSF-BES NSF-MCB NSF-CHF ONR
George Wagner (University of Kentucky)	Metabolic Engineering to Study the Regulation/Plasticity of and to Modify Diterpene Metabolism in Trichome Gland Cells	1 year	$100,000 $76,000 $100,000	NSF-IBN NSF-CHE USDA

Dhinakar Kompala (University of Colorado, Boulder) **Min Zhang** (National Renewable Energy Laboratory)	Maximizing Ethanol Production by Engineered Pentose-Fermenting Zymomonas mobilis	2 years	$300,000 $300,000	USDA DOE
Total **6 Project Awards**			**$3,058,854**	

For more information on NSF-funded awards, use the NSF Search Page.

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