Program Announcement
To DOE National Laboratories
LAB 05-10

Poplar Genome Based Research
For Carbon Sequestration in Terrestrial Ecosystems

SUMMARY: The Office of Biological and Environmental Research (OBER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving proposals for the Poplar Genome Based Research for Carbon Sequestration in Terrestrial Ecosystems program. Research is requested that could lead to strategies to improve the use of trees within the genus *Populus* (poplar), or other trees, for long-term sequestration of meaningful amounts of atmospheric carbon in terrestrial ecosystems. Specifically, proposals are sought for research to use the poplar and/or microbial genomic sequences to enhance partitioning of carbon into quantitatively important recalcitrant components of trees or soil organic matter that could lead to enhanced carbon sequestration. Research should build on the recently completed genomic sequence of a female black cottonwood tree (*Populus balsamifera* L. ssp. *trichocarpa* (Torr. & Gray ex Hook.) Brayshaw, clone Nisqually-1) and, when relevant, the availability of a growing number of microbial genomic sequences to obtain the scientific understanding needed to select, breed, or manage trees to meaningfully enhance sequestration of carbon in tree biomass and/or the soil.

DATES: Researchers are encouraged (but not required) to submit a brief preproposal for programmatic review. Preproposals should be submitted by January 18, 2005, to allow time for meaningful dialogue.

The deadline for receipt of formal proposals is 4:30 p.m., Eastern Time, March 8, 2005 to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2005.

ADDRESSES: Preproposals, referencing Program Announcement LAB 05-10, should be sent by e-mail to: jeff.amthor@science.doe.gov. Use "Program Announcement LAB 05-10" as the subject of the email.

Formal proposals in response to Program Announcement LAB 05-10 are to be submitted as 2 paper copies of the proposal and one CD containing the proposal in PDF format, all applications submitted in response to this Program Announcement should be contained completely within a single PDF file.

The 2 copies of the proposal and the CD, referencing Program Announcement LAB 05-10, should be sent to: Life Sciences Research Division, SC-72, Office of Biological and Environmental Research, 19901 Germantown Road, Germantown, MD 20874-1290, ATTN: Program Announcement LAB 05-10.

When submitting by U.S. Postal Service Express Mail, any commercial mail delivery service, or when hand carried by the researcher, the following address must be used: Life Sciences Research Division, SC-72, Office of Biological and Environmental Research, SC-75, Office of Science, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290, ATTN: Program Announcement LAB 05-05.

FOR FURTHER INFORMATION CONTACT: Dr. Jeff Amthor, Life Sciences Research Division, SC-72/Germantown Building, Office of Biological and Environmental Research, Office of Science, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, D.C. 20585- 1290, telephone: (301) 903-2507, E-mail: jeff.amthor@science.doe.gov, fax: (301) 903-8519.

SUPPLEMENTARY INFORMATION: The DOE Joint Genome Institute recently sequenced, eight times over for high quality, the nuclear genome of a female clone (Nisqually-1) of black cottonwood. This was the first, and presently only, woody plant whose nuclear genome has been sequenced. An annotation jamboree will take place December 6-10, 2004.

Populus (poplar) has advantages both as a model organism and as a potential crop for carbon sequestration. Poplar is easily mutated, has facile transgenesis, and is easily cloned. Its physiology is relatively well characterized and it has a relatively small, compact nuclear genome of approximately 480 Mbases (four times larger than *Arabidopsis thaliana* but less than 1% the size of red pine). In addition to the recently obtained full sequence of the nuclear genome of the black cottonwood clone, much is known about the genomes of poplars in general, and genetic tools exist for poplar research, including genetic linkage maps, BAC (bacterial artificial chromosome) libraries, EST (expressed sequence tags) libraries, and QTLs (quantitative trait loci) for mapping of physiological traits in poplar. Poplar is also highly productive in many environments, and has a wide ecological range or distribution (e.g., one or more poplar species is native to each state except Hawaii, and eastern cottonwood, *P. deltoides*, is native to 43 states). Moreover, poplar produces products and services of considerable value to humans and many ecological ecosystems in addition to carbon storage.

Research based on the recently sequenced black cottonwood genome might be used to improve tree breeding and forest management practices that would enable significant quantities of carbon to be sequestered in poplar and other trees. In addition, a significant fraction of the carbon associated with a stand of trees is in soil organic matter pools, rather than in aboveground biomass or living roots. The poplar genome sequence information might be used to develop ways to enhance both the production and translocation of organic compounds from leaves and shoots to roots and soil where it might lead to long-term storage of carbon in soil.

Request for Proposals

This notice solicits research that will build on the recent sequencing of the black cottonwood nuclear genome to investigate ways in which long-term, purposeful carbon sequestration in tree biomass and soil organic matter might be improved. Two general factors could be considered: (1) increased net primary production of tree stands (i.e., increased tree growth) and/or (2) increased partitioning of assimilated carbon into recalcitrant components of tree biomass and/or

soil organic matter that are of quantitative importance to the carbon balance of a forest. Where soils are included in a project, it might be useful to consider the genomic sequences of important soil organisms associated with poplar or related trees. Microbially based projects should be well related to, and integrated with, the tree component of a forest ecosystem. Lists of microbes that have had, or are having, their genomes sequenced by DOE are at http://www.jgi.doe.gov/sequencing/DOEmicrobes.html and http://microbialgenome.org/organisms.shtml.

Projects that involve field demonstrations, such as field tests of carbon sequestration by different poplar clones or demonstrations of effects of different management practices on stand carbon balance, will not be considered for funding. Field deployment of any transgenic materials will not be considered for support. Projects that focus on fundamental steps of light harvesting by photosynthesis or early metabolic steps in carbon assimilation will not be considered. The focus instead should be on opportunities to use the poplar and/or microbial genomic sequences to enhance partitioning of carbon into quantitatively important recalcitrant components of trees or soil organic matter that could lead to meaningfully enhanced carbon sequestration.

Program Funding

It is anticipated that up to $2,000,000 will be available for multiple awards to be made in Fiscal Year 2005, contingent on the availability of appropriated funds. Proposals may request project support for up to three years, with out-year support contingent on the availability of funds, progress of the research, and programmatic needs. Annual budgets are expected to range from $100,000 to $500,000 total costs, unless there is prior approval from the Program Manager.

Preproposals

A brief (one-page) preproposal is strongly encouraged (but not required) prior to submission of a full proposal. The preproposal should identify the institution; the Principal Investigator's name, telephone number, and e-mail address; the title of the proposed project; and names and institutions of any proposed collaborators. The preproposal should include a narrative describing the research project objectives and methods of accomplishment. These will be reviewed relative to the scope and research needs of the Poplar Genome Based Research for Carbon Sequestration in Terrestrial Ecosystems program. Please note that notification of a successful preproposal is not an indication that an award will be made in response to the formal proposal.

Submission Information

For this Announcement, proposals must conform to the following two requirements: the height of the letters must be at least 10 point and the margins must be at least one inch on all sides. Figures, charts, tables, figure legends, etc., may contain smaller type as long as it is legible. DOE is under no obligation to pay for any costs associated with the preparation or submission of proposals if an award is not made.

The proposal should be arranged in the following order:

- Field Work Proposal (FWP) Format (Reference DOE Order 5700.7C) (DOE ONLY)
- Proposal Cover Page
- Table of Contents
- Budget (DOE Form 4620.1) and Budget Explanation
- Abstract (one page)
- Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel)
- Literature Cited
- Biographical Sketch(es)
- Description of Facilities and Resources
- Other Support of Investigator(s)
- Appendix (optional)

Abstract (on a page by itself)

Provide an abstract of less than 400 words. Give the project objectives (in broad scientific terms), the approach to be used, and what the research is intended to accomplish. State the hypotheses to be tested (if any). At the top of the abstract give the project title, names of all the investigators and their institutions, and contact information for the principal investigator, including e-mail address.

Narrative

The narrative comprises the research plan for the project and is limited to **20 pages (maximum)**. It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science. The major part of the narrative should be devoted to a description and justification of the proposed project, including details of the methods to be used. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities.

If any portion of the project is to be done in collaboration with another institution (or institutions), provide information on the institution(s) and what part of the project it will carry out. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation", "Biographical Sketches", and "Description of Facilities and Resources".

Literature Cited

Give full bibliographic entries for each publication cited in the narrative.

Biographical Sketches

This information is required for senior personnel at the institution submitting the proposal and at all subcontracting institutions (if any). The biographical sketch is limited to a maximum of **two pages** for each investigator.

To assist in the identification of potential conflicts of interest or bias in the selection of reviewers, the following information **must be provided in each biographical sketch**.

> **Collaborators and Co-editors:** A list of all persons in alphabetical order (including their current organizational affiliations) who are currently, or who have been, collaborators or co- authors with the investigator on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of the proposal. Also include those individuals who are currently or have been co-editors of a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of the proposal. If there are no collaborators or co-editors to report, this should be so indicated.
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> **Graduate and Postdoctoral Advisors and Advisees:** A list of the names of the individual's own graduate advisor(s) and principal postdoctoral sponsor(s), and their current organizational affiliations. A list of the names of the individual's graduate students and postdoctoral associates during the past 5 years, and their current organizational affiliations.

Description of Facilities and Resources

Facilities to be used for the conduct of the proposed research should be briefly described. Indicate the pertinent capabilities of the institution, including support facilities (such as machine shops), that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution (if any).

Other Support of Investigators

Other support is defined as all financial resources, whether Federal, non-Federal, commercial, or institutional, available in direct support of an individual's research endeavors. Information on active and pending other support is required for all senior personnel, including investigators at collaborating institutions to be funded by a subcontract. For each item of other support, give the organization or agency, inclusive dates of the project or proposed project, annual funding, and level of effort (months per year or percentage of the year) devoted to the project.

Appendix (optional)

Information not easily accessible to a reviewer may be included in an appendix, but **do not use the appendix to circumvent the page limitations of the proposal.** Reviewers are not required to consider information in an appendix, and reviewers may not have time to read extensive appendix materials with the same care they would use with the proposal proper.

The appendix may contain the following items: up to five publications, manuscripts accepted for publication, abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community; and letters from investigators at other institutions

stating their agreement to participate in the project (do not include letters of endorsement of the project).

The instructions and format described below should be followed. Reference Program Announcement LAB 05-10 on all submissions and inquiries about this program.

OFFICE OF SCIENCE
GUIDE FOR PREPARATION OF SCIENTIFIC/TECHNICAL PROPOSALS
TO BE SUBMITTED BY NATIONAL LABORATORIES

Proposals from National Laboratories submitted to the Office of Science (SC) as a result of this program announcement will follow the Department of Energy Field Work Proposal process with additional information requested to allow for scientific/technical merit review. The following guidelines for content and format are intended to facilitate an understanding of the requirements necessary for SC to conduct a merit review of a proposal. Please follow the guidelines carefully, as deviations could be cause for declination of a proposal without merit review.

1. Evaluation Criteria

Proposals will be subjected to formal merit review (peer review) and will be evaluated against the following criteria which are listed in descending order of importance:

Scientific and/or technical merit of the project

Appropriateness of the proposed method or approach

Competency of the personnel and adequacy of the proposed resources

Reasonableness and appropriateness of the proposed budget

The evaluation will include program policy factors such as the relevance of the proposed research to the terms of the announcement and the Department's programmatic needs. External peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Non-federal reviewers may be used, and submission of a proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

2. Summary of Proposal Contents

- Field Work Proposal (FWP) Format (Reference DOE Order 5700.7C) (DOE ONLY)
- Proposal Cover Page
- Table of Contents
- Budget (DOE Form 4620.1) and Budget Explanation
- Abstract (one page)
- Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel)

- Literature Cited
- Biographical Sketch(es)
- Description of Facilities and Resources
- Other Support of Investigator(s)
- Appendix (optional)

2.1 Number of Copies to Submit

Formal proposals in response to Program Announcement LAB 05-10 are to be submitted as 2 paper copies of the proposal and one CD containing the proposal in PDF format, all applications submitted in response to this Program Announcement should be contained completely within a single PDF file.

3. Detailed Contents of the Proposal

Adherence to type size and line spacing requirements is necessary for several reasons. No researcher should have the advantage, or by using small type, of providing more text in their proposals. Small type may also make it difficult for reviewers to read the proposal. Proposals must have 1-inch margins at the top, bottom, and on each side. Type sizes must be 10 point or larger. Line spacing is at the discretion of the researcher but there must be no more than 6 lines per vertical inch of text. Pages should be standard 8 1/2" x 11" (or metric A4, i.e., 210 mm x 297 mm).

3.1 Field Work Proposal Format (Reference DOE Order 5700.7C) (DOE ONLY)

The Field Work Proposal (FWP) is to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office. Additional information is also requested to allow for scientific/technical merit review.

Laboratories may submit proposals directly to the SC Program office listed above. A copy should also be provided to the appropriate DOE operations office.

3.2 Proposal Cover Page

The following proposal cover page information may be placed on plain paper. No form is required.

Title of proposed project
SC Program announcement title
Name of laboratory
Name of principal investigator (PI)
Position title of PI
Mailing address of PI
Telephone of PI
Fax number of PI
Electronic mail address of PI

Name of official signing for laboratory*
Title of official
Fax number of official
Telephone of official
Electronic mail address of official
Requested funding for each year; total request
Use of human subjects in proposed project:
    If activities involving human subjects are not planned at any time during the proposed project period, state "No"; otherwise state "Yes", provide the IRB Approval date and Assurance of Compliance Number and include all necessary information with the proposal should human subjects be involved.
Use of vertebrate animals in proposed project:
    If activities involving vertebrate animals are not planned at any time during this project, state "No"; otherwise state "Yes" and provide the IACUC Approval date and Animal Welfare Assurance number from NIH and include all necessary information with the proposal.
Signature of PI, date of signature
Signature of official, date of signature*

*The signature certifies that personnel and facilities are available as stated in the proposal, if the project is funded.

3.3 Table of Contents

Provide the initial page number for each of the sections of the proposal. Number pages consecutively at the bottom of each page throughout the proposal. Start each major section at the top of a new page. Do not use unnumbered pages and do not use suffices, such as 5a, 5b.

3.4 Budget and Budget Explanation

A detailed budget is required for the entire project period and for each fiscal year. It is preferred that DOE's budget page, Form 4620.1 be used for providing budget information*. Modifications of categories are permissible to comply with institutional practices, for example with regard to overhead costs.

A written justification of each budget item is to follow the budget pages. For personnel this should take the form of a one-sentence statement of the role of the person in the project. Provide a detailed justification of the need for each item of permanent equipment. Explain each of the other direct costs in sufficient detail for reviewers to be able to judge the appropriateness of the amount requested.

Further instructions regarding the budget are given in section 4 of this guide.

It is anticipated that individual research awards for the first two components of this Notice (multi protein complexes and genetic regulatory network analysis) will be funded at a level of approximately $1-6 million per year (total costs) for 3 to 5 years and that research awards for the

third component of this Notice (predictive model development) will be funded at a level of approximately $1-2 million per year (total costs) for 3 to 5 years. Researchers should also describe a scientifically justified scale-up plan to maximize technology development and research productivity.

* Form 4620.1 is available at web site: http://www.sc.doe.gov/grants/Forms-E.html

3.5 Abstract

Provide an abstract of less than 400 words. Give the project objectives (in broad scientific terms), the approach to be used, and what the research is intended to accomplish. State the hypotheses to be tested (if any). At the top of the abstract give the project title, names of all the investigators and their institutions, and contact information for the principal investigator, including e-mail address.

3.6 Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel)

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3.7 Literature Cited

Give full bibliographic entries for each publication cited in the narrative.

3.8 Biographical Sketches

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Graduate and Postdoctoral Advisors and Advisees: A list of the names of the individual's own graduate advisor(s) and principal postdoctoral sponsor(s), and their current organizational affiliations. A list of the names of the individual's graduate students and postdoctoral associates during the past 5 years, and their current organizational affiliations.

3.9 Description of Facilities and Resources

Facilities to be used for the conduct of the proposed research should be briefly described. Indicate the pertinent capabilities of the institution, including support facilities (such as machine shops), that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution (if any).

3.10 Other Support of Investigators

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3.11 Appendix

Information not easily accessible to a reviewer may be included in an appendix, but **do not use the appendix to circumvent the page limitations of the proposal.** Reviewers are not required to consider information in an appendix, and reviewers may not have time to read extensive appendix materials with the same care they would use with the proposal proper.

The appendix may contain the following items: up to five publications, manuscripts accepted for publication, abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community; and letters from investigators at other institutions stating their agreement to participate in the project (do not include letters of endorsement of the project).

4. Detailed Instructions for the Budget

(DOE Form 4620.1 "Budget Page" may be used)

4.1 Salaries and Wages

List the names of the principal investigator and other key personnel and the estimated number of person-months for which DOE funding is requested. Proposers should list the number of postdoctoral associates and other professional positions included in the proposal and indicate the number of full-time-equivalent (FTE) person-months and rate of pay (hourly, monthly or annually). For graduate and undergraduate students and all other personnel categories such as secretarial, clerical, technical, etc., show the total number of people needed in each job title and total salaries needed. Salaries requested must be consistent with the institution's regular practices. The budget explanation should define concisely the role of each position in the overall project.

4.2 Equipment

DOE defines equipment as "an item of tangible personal property that has a useful life of more than two years and an acquisition cost of $25,000 or more." Special purpose equipment means equipment which is used only for research, scientific or other technical activities. Items of needed equipment should be individually listed by description and estimated cost, including tax, and adequately justified. Allowable items ordinarily will be limited to scientific equipment that is not already available for the conduct of the work. General purpose office equipment normally will not be considered eligible for support.

4.3 Domestic Travel

The type and extent of travel and its relation to the research should be specified. Funds may be requested for attendance at meetings and conferences, other travel associated with the work and subsistence. In order to qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Consultant's travel costs also may be requested.

4.4 Foreign Travel

Foreign travel is any travel outside Canada and the United States and its territories and possessions. Foreign travel may be approved only if it is directly related to project objectives.

4.5 Other Direct Costs

The budget should itemize other anticipated direct costs not included under the headings above, including materials and supplies, publication costs, computer services, and consultant services (which are discussed below). Other examples are: aircraft rental, space rental at research establishments away from the institution, minor building alterations, service charges, and fabrication of equipment or systems not available off- the-shelf. Reference books and periodicals may be charged to the project only if they are specifically related to the research.

a. Materials and Supplies

The budget should indicate in general terms the type of required expendable materials and supplies with their estimated costs. The breakdown should be more detailed when the cost is substantial.

b. Publication Costs/Page Charges

The budget may request funds for the costs of preparing and publishing the results of research, including costs of reports, reprints page charges, or other journal costs (except costs for prior or early publication), and necessary illustrations.

c. Consultant Services

Anticipated consultant services should be justified and information furnished on each individual's expertise, primary organizational affiliation, daily compensation rate and number of days expected service. Consultant's travel costs should be listed separately under travel in the budget.

d. Computer Services

The cost of computer services, including computer-based retrieval of scientific and technical information, may be requested. A justification based on the established computer service rates should be included.

e. Subcontracts

Subcontracts should be listed so that they can be properly evaluated. There should be an anticipated cost and an explanation of that cost for each subcontract. The total amount of each subcontract should also appear as a budget item.

4.6 Indirect Costs

Explain the basis for each overhead and indirect cost. Include the current rates.