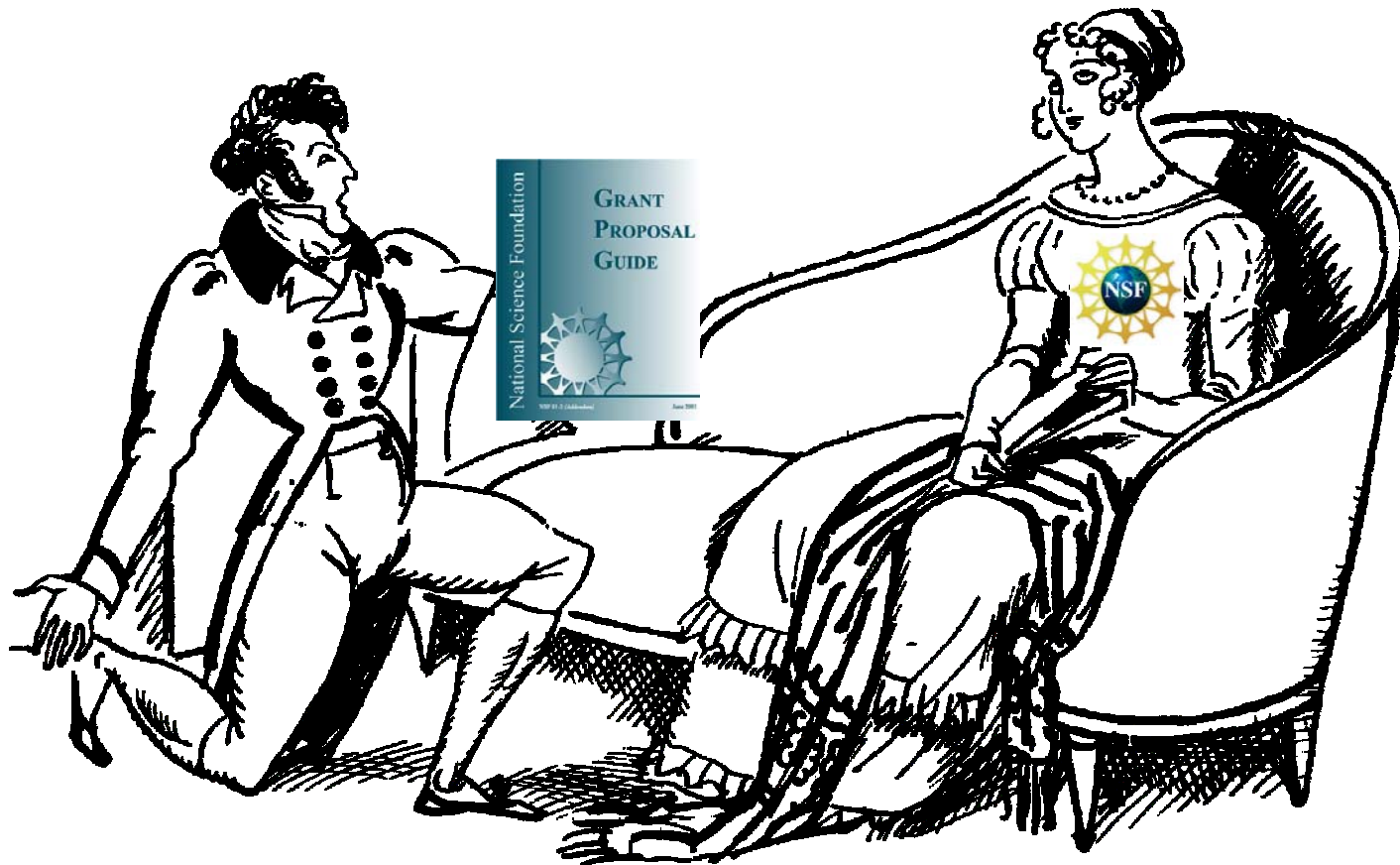


# Writing Effective Grant Proposals

Alan Nathan  
University of Illinois  
a-nathan@uiuc.edu

(with some material borrowed from my colleagues  
Lance Cooper, Dave Hertzog, Celia Elliott)



# Outline

- Preliminary steps
- Key components of a proposal
- Preparing a budget
- More detail on the project summary
- A detailed example

# Preliminary Step 1. Identify the Sources of Funding in the Sciences

One of the most important first steps in acquiring funding, of course, is to know all the potential sources of funding for research in science:

National Science Foundation (NSF)

Department of Energy (DOE)

Department of Education (DOEd)

National Security Agency (NSA)

Air Force Office of Scientific Research (AFOSR)

Army Research Office (ARO)

Defense Advance Research Projects Agency (DARPA)

NASA

National Institute of Health (NIH)

Office of Naval Research (ONR)



# Preliminary Step 2. Investigate the programs

Your next step is to investigate important details about the various program opportunities:

## 1. What projects are already funded?

There can't be too much overlap of your proposed work with an existing program



## 2. What is the typical range of funding offered by the program?

You should have some idea of the typical funding range offered by the program, because your proposal can be dismissed outright if your budget requests are too extravagant

## 3. What are the stated program goals of the funding agency?

Make sure that your research goals can be, and are, written so as to coincide as closely as possible with the stated goals of the funding agency and the specific program!

# Tips for writing your *first* proposal

## Important advice from an expert:

“There is one over-riding principle: You must convince the referees that the project is so far along that it would be a mistake to stop it. Put another way: **Every first proposal should read as a renewal proposal.** If you keep this firmly in mind, writing the proposal is a breeze.”

- *John Wilkins, 1987, Cornell (now at Ohio St)*



## What does this mean?

- Even first proposals need to be written so that the work appears to be on-going and too important to stop
- Results of preliminary experiments and/or calculations need to be a prominent feature of proposals, even first proposals
- The research proposed should be compelling and should appear to extend naturally from the exciting results presented

# Key components of a good proposal

Project Summary

Results from Prior Support

Introduction

Review of Previous Research

Proposed Research

Budget/Budget Justification

References Cited

Curriculum Vitae/Publications

# Project Summary

The **Project Summary** should be written last, and should capture the most important and exciting elements of your proposal.

You should include a project summary with your proposal even if it is not required by the funding agency, as it is often the **first and last** thing read by a referee or program director.

We'll talk more about the project summary later

# Results from Prior Support

The **Results from Prior Support** section should describe any recent past research you have conducted that was supported by the agency to which you are applying for funding.



## TIPS:

1. Divide distinct areas of research conducted into separate sections
2. Briefly describe the key results obtained, and try to convey both significance of the research and its importance to the agency's goals
3. In each section, list the papers published or submitted that resulted from prior support by the agency



# Results from Prior Support



## TIPS:

4. Even if the program does not explicitly request this information, it is a good idea to describe what your past work is, and how it impacts the agency's goals
5. Convince the reviewers that you have delivered on past promises

# Introduction

The **Introduction** provides a broader context for your research, i.e., it provides “the big picture.”

This section (i) shows the funding agency how your research fits in with its funding areas, and (ii) demonstrates that you understand the essential scientific issues associated with your research proposal



## TIPS:

1. This section should be succinct, no more than 2-3 pages, and it should summarize the major, and most exciting, points of the proposal
2. This section should emphasize not only the compelling features of the proposal, but also why you are the person ideally suited to investigating these features!
3. This section should include substantial background information regarding the current experimental and theoretical issues confronting your field, (i) so the referees can understand the import of your proposal, and (ii) so the referees get the impression that you are an expert in the field

# Review of the Field

The proposal should include a **review of previous research**, either as part of the introduction or as a separate section.

The goals of this section are to:

- (i) persuade the referees that you are knowledgeable about your proposed field
- (ii) convince the referees that you are aware of the key scientific issues and previous publications in the field

Remember that the referees for your proposal will likely be in the field you're proposing to do research, so perform an incomplete review of past research at your own peril!

**This section of the proposal should contain:**

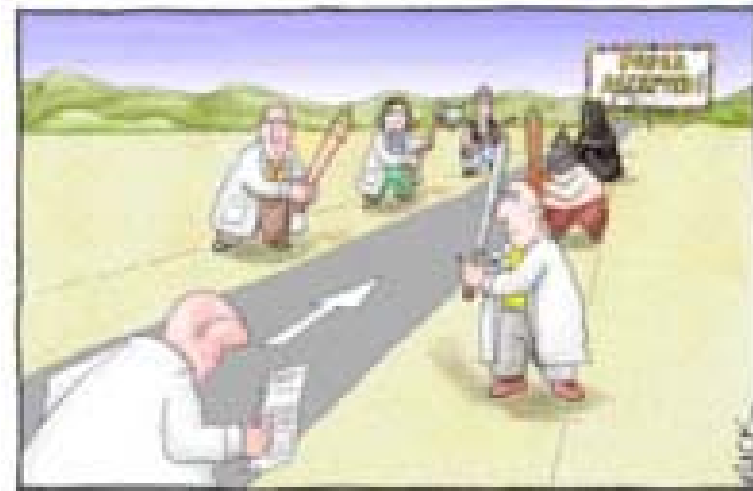
- (i) a general review of your proposed field, with lots of references
- (ii) a description of your contributions to the field

**Bottom line** - this section should leave the referees with a clear idea of the important problems you are already in the process of solving!



# Proposed Research

The **Proposed Research** section describes your specific research plans



Most scientists regarded the new streamlined peer-review process as 'quite an improvement'

## TIPS:

1. Avoid equations and technical jargon in favor of a clear description of the essential science involved in the proposal
2. Break up this part of your proposal into well-defined sections, and even subsections, in order to be as clear as possible in describing your proposal
3. Use figures and diagrams to demonstrate your ideas as clearly as possible.
4. Include data or computations to illustrate your ability to perform the experiments or calculations proposed
5. This section should include a clear description of the steps you plan to take to accomplish your research goals

# Additional Tips



**Project yourself:** If at all possible, convey something unique about yourself and your research in the proposal. To referees and program directors, you should appear to be the ideal person to carry out the research you're proposing

**Don't propose to do too much:** Don't propose more than you can reasonably accomplish in the allotted time. Doing so provides an easy target for referees

**Outline your procedure clearly:** Clearly outline the steps by which you plan to achieve your proposed goals, perhaps even providing a timeline. Vague strategies invite negative remarks from referees

**Make sure each procedural step is reasonable:** Make sure your plan has achievable steps, that you convey your understanding of potential technical difficulties, and that propose alternative strategies in case initial plans fail

# Additional Tips (cont.)



**Explicitly respond to the criteria:** Before submitting, review the criteria listed in the RFP. Make sure you've hit all of the program's major points

**Obtain local advice:** Ask your adviser or senior colleague to read and critique your proposal. This will help minimize minor (and major) flaws that may diminish the effectiveness of your proposal

**Proofread and check for grammar:** A sloppy, poorly written proposal undermines the quality of the ideas presented, and a well-written and well-formatted proposal conveys the sense that the PI is competent and knowledgeable

# Preparing a Proposal Budget and Justification



**Alan Nathan**  
***University of Illinois***  
***a-nathan@uiuc.edu***

***With lots of material  
from Celia Elliott***



# **Your budget must conform to your technical description**

**Go through the narrative and highlight every activity that has financial implications—make a list of everything that will have to be paid for**

**Assign each one of those costs to an appropriate budget category—personnel, equipment, materials and supplies, telecommunications, travel, services, publications...**



**Also note the non-monetary contributions your institution will make to the project**

**Emphasize these contributions in your budget narrative**

**Prior investment in facilities and equipment lowers the cost of doing this project for the funder, putting you at an advantage over competing proposals**

# **Your budget must be realistic**

**Reviewers and program officers know what things cost; if your budget is not realistic they will think you are either dishonest or stupid**

**A budget that is too low may make it impossible to complete the project, which will jeopardize your chances for future funding**

**Estimate costs as accurately as possible; get written price quotations for equipment and binding agreements for subcontracts**

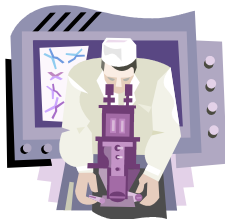
# Budgets must conform to the RFP and include only *eligible* costs

**Personnel**



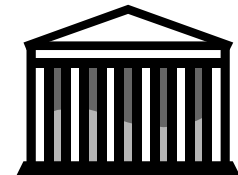
**Travel**

**Equipment and Supplies**



**Other Eligible Costs**

**Institutional Overhead**



**The RFP will also tell you what costs are not *eligible***

**Payments to individuals who do no work on the project**

**Travel that is not connected to the research project**

**Equipment and supplies that will not be used in the research project**

**Entertainment**

**Construction, repair, or remodeling of facilities**

# Evaluate every item in your budget with a reviewer's skeptical eyes

Teach yourself  
to ask the  
questions that  
a reviewer  
would ask



# Questions about Personnel



**Are all these people really needed to do the work?**

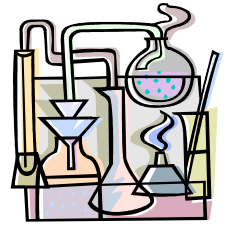
**What is each person actually going to do?**

**Does the budget allocation accurately reflect each person's work contribution?**

**Is there an appropriate distribution of categories of personnel?**

**Are the salaries in line with funder guidelines?**

# Equipment and supplies?



**Is the equipment needed to carry out the experiments described in the work plan?**

**Should the grantee already have this equipment? Is it replacing existing equipment? Why?**

**Is the equipment requested the best suited for the job to be done?**

**Are the supplies requested needed and the amounts reasonable?**

# **Is the travel justified?**



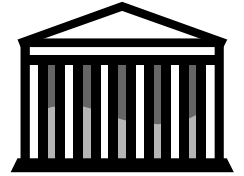
**Is the travel necessary to carry out the work proposed?**

**Why travel to conferences in the first year of the project before there are any results to present?**

**Does the conference travel represent appropriate fora for results obtained in this project?**

**Why travel to one another's labs at the end of the project?**





**Are the institutional costs calculated correctly?**

**Do they exceed the maximum allowed by the funder guidelines?**

# Finally, review the rules and double-check *everything*



**Check your arithmetic —  
is everything added  
correctly?**

**Have you included all  
required information?**

**Has every line and every  
box been completed?**

# **The budget narrative should explain how costs were determined**

**Explain what each person will do to contribute to the project**

**Explain why equipment is needed and how it will be used in the project**

**Provide written price quotations for expensive items of equipment**

**Itemize each budget line**

**Ensure that your costs are realistic and in line with the scope of work to be done**

**The budget narrative should make a persuasive case for investing in you and your team**

**Demonstrate that project is cost-effective, that it will have a significant impact for a reasonable cost**

**Remind the reviewer again why your project is important—what new knowledge you will create, what important problem you will solve, what useful applications you will enable**



# Example of a well-organized, clear budget summary

## **Section F. Budget Justification**

An itemized budget for the one-year proposed project and a cumulative budget are presented on NSF Forms 1030, pages 1–2 of this section. A total of \$99,942 is requested from the National Science Foundation (NSF). In this section, we provide detailed justification for each line item. Section headings used below correspond to the respective sections of Form 1030.

### **A. Senior Personnel**

Funds are requested for summer salary (1.5 months) for the PI, A. Bezryadin.

### **B. Other Personnel**

Funds are requested for a graduate student (50-percent time for 11 months). Graduate student tuition remission of \$5841 is included as “other direct costs” on line G.6 of the budget.

### **C. Fringe Benefits**

Fringe benefits have been calculated in accordance with the rates published in the *Urbana-Champaign Campus and Central Administration FY04 Facilities/Administrative, Tuition Remission, and Fringe Benefit Rates* schedule (rev. 8/25/03).

### **D. Equipment**

Funds are requested to purchase an Osmium Plasma Coater Model OPC-60 metal deposition system (\$36,000). This is an essential piece of equipment, which will allow the formation of a uniform metallic film on single molecules and molecular assemblies. More information on this system and a written quotation are included in Section I, Supplementary Documentation, of this proposal. Should a contract be awarded by NSF, competitive bids would be solicited on this equipment, in conformance with standard University practices.

**Use the budget narrative to show institutional support of and commitment to your project**

**To make your proposal more attractive, identify existing special equipment or unique facilities that your institution owns which will be used in the project**

**If your institution is contributing “in-kind” goods or services to the project, be sure to emphasize it**

# Writing a Project Summary

## PROJECT SUMMARY

A three-year project is proposed by the Department of Physics at the University of Illinois at Urbana-Champaign that will develop and test educational materials and software for an integrated introductory physics curriculum suitable for large-enrollment classes at research universities. Educational materials to be developed include interactive, WorldWideWeb-based homework problems designed to improve functional understanding of basic physical principles and machine-gradable examination questions that measure functional understanding. Powerful interactive software for student learning and course administration, will be refined and disseminated to peer institutions.

Materials to provide teaching assistant training in instructional strategies based on physics education research will be developed and tested. A model for professional development for postdoctoral research associates that exposes them to new instructional methods and provides opportunities for them to polish their presentation and communication skills will also be implemented.

Alan Nathan, Lance Cooper, and Celia Elliott





# What is a Project Summary?

It's not just an abstract! It summarizes (generally for publication) all elements of the proposal:

the motivation for, and significance of, the project

the goals of the project

the methods that will be used to achieve the project's goals

the benefits of the proposed work to the funding agency

It is usually the first and last thing the reviewer and program director will read



# What is a Project Summary?

It can be no longer than one page

It should be written in the third person

It should be written so as to be

(i) informative to persons in the same or related fields

(ii) understandable to a scientifically literate reader not  
inside your field



# The Project Summary

The project summary should address the following questions, in the following order:

What is the goal of the project?

Why is this goal important?

What methods will be used to achieve this goal?

What are the benefits of the project to the funding agency, and to society?



# What is a Project Summary?

Example:

The goal of this proposed project aims to design, build, and test a hydroelectric dam in Boneyard Creek. This project is motivated by the need to eliminate the UIUC's dangerous dependence on foreign oil. To achieve this goal, this project will employ innovative and indigenous building materials, such as cornhusks, and exploit unique interdisciplinary collaborations with UIUC's Electrical Engineering, Civil Engineering, and Food Science departments.

The anticipated outcome of this project will be an estimated 50% reduction in electric costs for the UIUC, as well as increased opportunities for waterfront development and boating on the Bardeen quad.



# What is a Project Summary?

What you're proposing

Example:

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# What is a Project Summary?

Example:

Why the proposal is important

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# What is a Project Summary?

What methods you'll use to accomplish the goals

Example:

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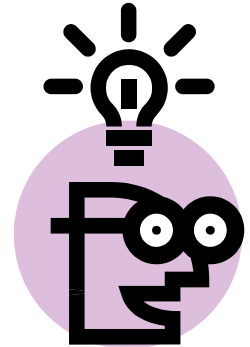
What the funding agency and society will get out of the proposed work





The Project Summary **MUST** have the following two elements:

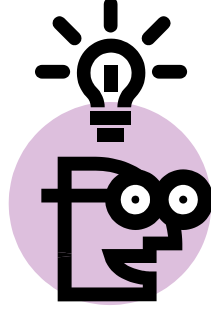
(i) A statement concerning the “intellectual merit” of the proposed study



(ii) A statement concerning the “broader impact” of the proposed study



# What is the Intellectual Merit of a Proposal?



The Intellectual Merit reflects the following elements:

How important is the proposed work to advancing knowledge in the relevant field?

How well-qualified is the proposer to conducting the project?

To what extent does the proposed work explore creative and original concepts?

How well-conceived and organized is the proposed activity?

Does the proposer have adequate access to resources needed for the project?



# What is the Intellectual Merit of a Proposal?

## Example:

This proposed work has substantial *intellectual merit* for several reasons: It will provide a better understanding of how polluted waterways can be harnessed for power and recreation; it will decrease the UIUC's reliance on oil from foreign lands, such as Texas; it will involve the innovative use of indigenous building materials, including cornhusks; and it will benefit from the unique capabilities of the proposer, who has longtime expertise with novel building materials such as Legos and Lincoln Logs.



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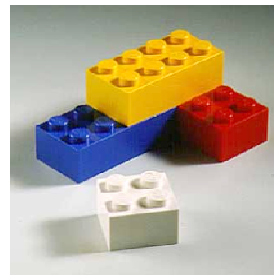
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# What is the Broader Impact of a Proposal?



The Broader Impact reflects the following elements:

How well does the project advance understanding while promoting teaching, training, and learning?

Will the project enhance the infrastructure for research and education?

Will the results be broadly disseminated to advance scientific understanding?

Will the project broaden the participation of underrepresented groups?

What are the benefits of the proposed activity to society?





# What is the Broader Impact of a Proposal?

## Example:

This proposed work will have *broader impact on the community for several reasons*: It will train students in novel fabrications methods involving corn products; it will involve a collaboration with American Inuits—a highly underrepresented group in science and engineering—to examine “best practices” for utilizing unconventional building materials; the results of this project will be disseminated in prestigious journals such as the *Journal of Irreproducible Results*; and the community will enjoy numerous benefits from this project, including paddleboat rides and windsurfing on the Bardeen quad.



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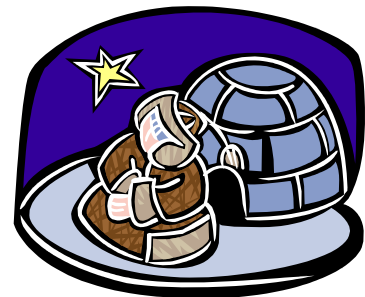
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# Tips for Writing the Project Summary



The project summary should be understandable on its own

Include (briefly) ALL elements of your proposal: why the project is important, what you plan to do, and how you plan to do it.

Define all acronyms, abbreviations, and symbols.

Don't include figures, tables, or references

Don't refer to anything in the main part of the proposal



# Tips for Writing the Project Summary



Don't make the referees guess where your “intellectual merit” and “broader impact” statements are: “The intellectual merit of this project is...”

The intellectual merit statement might include a discussion of your expertise in the field, your access to specialized resources, the importance of the proposed work to advancing knowledge in an important area. This statement, in part, describes why YOU are the person to do this important project!

The broader impact statement might include your plan to train students (e.g., grad students, undergrads), your interest in using the project for outreach (e.g., giving public lectures and demonstrations), a statement of the importance of your project for other fields, etc. This statement, in part, describes why your scientific field, society at large, and particularly Congressmen and Senators should care about this project!



**And now a detailed example from my Senior Thesis  
course....**

**A proposal for summer funding for Senior Thesis  
research**



**Proposal for implementing the diffusion Monte Carlo  
method in investigations of few-electron systems**

**Manny Ramirez**

Contact Information:

Manny Ramirez  
Loomis Laboratory of Physics  
University of Illinois at Urbana-Champaign  
1110 W. Green St.  
Urbana, IL 61801, USA  
Phone: +1-217-333-1234  
E-mail: [mannybeingmanny@uiuc.edu](mailto:mannybeingmanny@uiuc.edu)

## **Project Summary**

The application of *ab initio* methods in calculating electronic structures is an important aspect of theoretical condensed matter physics, and its importance is currently growing as the need for understanding novel materials increases. The goal of this proposed project is to investigate one *ab initio* electronic structure method known as the diffusion Monte Carlo (DMC) method. To achieve this goal, an undergraduate student will write computer programs to apply the DMC method in calculating the ground-state energies of various few-electron systems.

The project is expected to produce results that can be cross-examined with those produced for the same systems using different methods. It is also expected to produce results for comparisons between different implementations of the DMC method.

This proposed project has substantial intellectual merit for the following reasons: it provides a better understanding of the electronic structures of various few-electron systems; it gives insights for improving the DMC algorithm, without using too many computational resources; and it reveals the strengths and weaknesses of the DMC method as compared to other electronic structure methods. This project will benefit from the capabilities of the proposer, who has experience in working on similar projects. It will also benefit from the institution where the project will be carried out, where experienced faculty members in computational physics (e.g., Prof. Richard Martin and Prof. David Ceperly) can provide an extensive network for help and discussion.

The proposed project will have broader impact on the community for the following reasons: the student will acquire the skill of writing computer programs to solve physical problems and will be introduced to important concepts in theoretical physics; the results of the project will be disseminated in the form of a research proceeding, a senior thesis, a talk given in the annual undergraduate research symposium at the University of Illinois, and a talk given at the American Physical Society March 2006 meeting; attractive visualizations that can be used for educational purposes will also be produced.

# Project Narrative

## INTRODUCTION

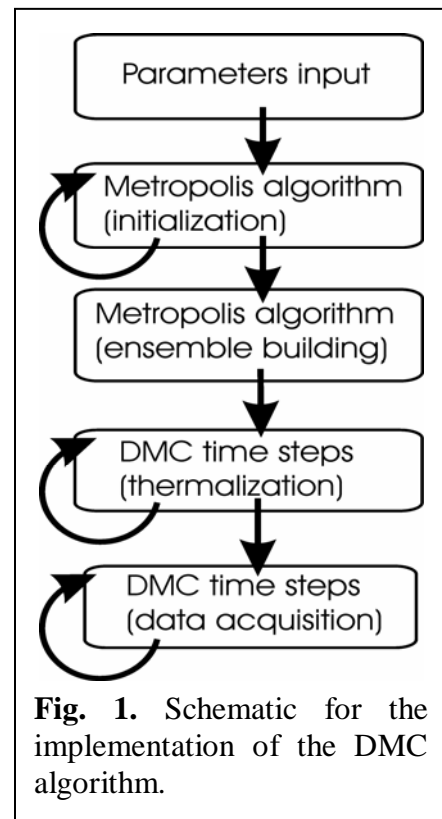
Theoretically, all electronic properties of a quantum system can be obtained by solving the time-independent Schrödinger equation (TISE) of the system. Since the TISE cannot be solved analytically in many cases, it is necessary to obtain numerical solutions. Commonly used numerical methods include mean-field methods (e.g., Hartree-Fock), configuration-interaction (CI) methods, and quantum Monte Carlo (QMC) methods. In general, as compared to the QMC methods, mean-field methods are cheap but prone to systematic errors, while configuration-interaction methods are accurate but expensive.

The proposed project will center on one particular QMC method known as the diffusion Monte Carlo (DMC) method, which can be derived from writing the time-dependent Schrödinger equation in imaginary time [2,3,6,7]. In the DMC method, wavefunctions are treated as probabilistic distributions and are represented by an ensemble of random samples. Upon applying random walks on an initial ensemble generated from a trial wavefunction, the ensemble evolves until its distribution is essentially that of the ground-state wavefunction.

In the proposed project, the DMC method will be applied to various few-electron systems. Few-electron systems are investigated since they do not require extensive computational resources, and since data obtained from other approaches are available for comparisons.

## METHOD

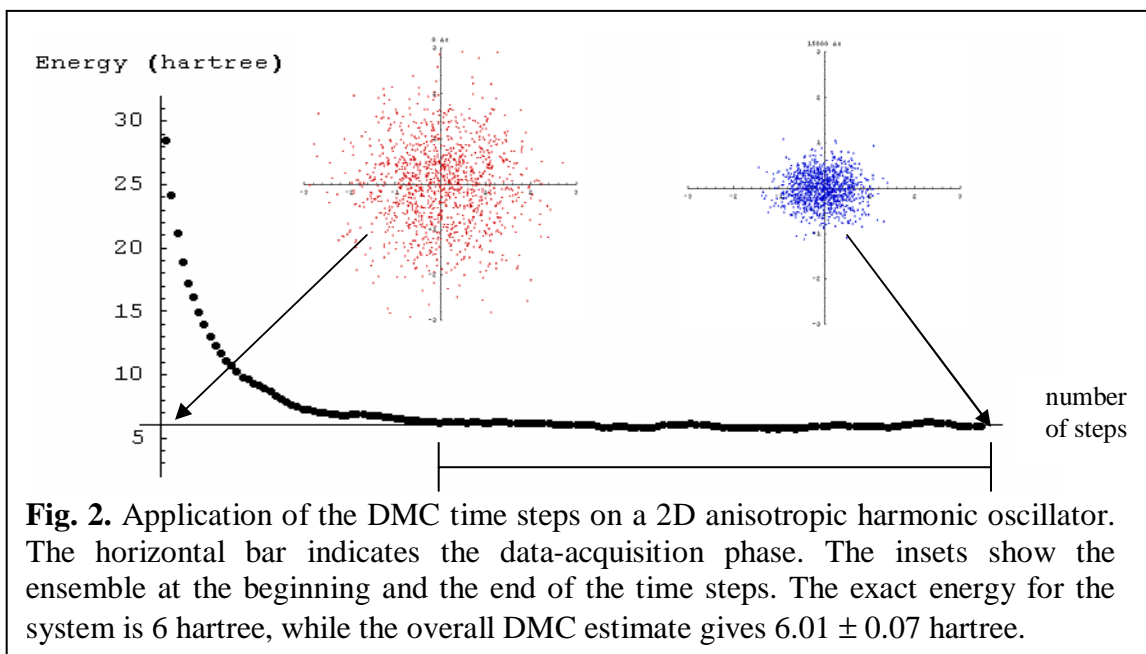
A schematic of how the DMC algorithm is implemented in computer programs is shown on Fig. 1. The various components are explained below. For further discussion, see refs. [3,5], and the references therein.



**Fig. 1.** Schematic for the implementation of the DMC algorithm.

- *Parameters input*: Parameters that define the few-electron systems and the trial wavefunctions are determined and entered as input.
- *Metropolis algorithm (initialization)*: The “random walker” to be used in the next procedure is initialized.
- *Metropolis algorithm (ensemble building)*: An initial ensemble that is distributed according to the square modulus of the trial wavefunction is produced.
- *DMC time step (thermalization)*: In this step, the ensemble evolves into a steady state, in which the ensemble is distributed according to the product of the ground-state wavefunction and the trial wavefunction.
- *DMC time step (data-acquisition)*: In this procedure, the ensemble remains in its steady state upon the application of time steps. The energy of the ensemble is calculated once every fixed interval of time steps, and the average energy provides an estimate of the ground-state energy of the system.

As an illustration, the application of DMC time steps on a two-dimensional (2D) harmonic oscillator is shown in Fig. 2.



Several subtleties in implementing the DMC algorithm will be investigated in the proposed project. They include:

- *Time-step error:* The DMC algorithm is based on discretizing the continuous evolution of the ensemble. Therefore, it produces a systematic error that depends on the DMC time step size.
- *Sign problem:* Because the ground-state wavefunction of a fermionic system in general contains nodes, the DMC algorithm needs modifications. One common way of tackling the sign problem—the fixed-node approximation—assumes that the nodes of the ground-state wavefunction are known *a priori*. This may result in systematic errors, as well as more severe statistical errors.
- *Choice of trial wavefunctions:* For a nodeless system, well chosen trial wavefunctions may reduce statistical errors. For systems whose ground-state wavefunctions have nodes, well chosen trial wavefunctions may reduce both statistical and systematic errors.

## SYSTEMS TO BE INVESTIGATED

The following systems will be investigated in the proposed project:

- *Hydrogen ( $H_2$ ) molecule:* The hydrogen molecule is scientifically interesting because it is the simplest molecule that exhibits covalent bonding. Moreover, calculations of the ground-state energy of the  $H_2$  molecule do not involve the sign problem. Hence, students can concentrate on analyzing the factors that affect the accuracy and effectiveness in any DMC calculations, with or without the sign problem. Furthermore, accurate calculations of the ground-state energy of this system were performed based on the CI method [4], which can be cross-examined with the results obtained from the proposed project.
- *Hooke's atom triplet:* The Hooke's atom consists of two electrons confined in a harmonic potential well. The triplet state for the Hooke's atom will be investigated since it is essentially the simplest case where the sign-problem arises. Moreover, the nodes of the system are determined uniquely from its topology [1], and hence the fixed-node approximation should not introduce any systematic error [7]. Furthermore, analytic solutions to the system can be obtained for particular values of potential well strengths [9], which again can be cross-examined with the results obtained from the proposed project.

## FEASIBILITY

For participating students, the proposed project requires only a clear understanding of basic quantum mechanics and some prior experience in any high-level computer language (e.g. FORTRAN, C/C++, or BASIC). Thus it is opened to vast number of undergraduate students with different backgrounds. Moreover, a large number of references are available for both the methods [2,3,5–7] to be used and the systems [1,4,9] to be investigated in this project. Furthermore, the scope of the project is both flexible and extensible. The project can either concentrate on one or two particular aspects of the DMC algorithm, or it can be a more general survey of the various aspects of the algorithm. Also, there are other few-electron systems that serve as natural extensions of the proposed project, such as a three-electron quantum dot problem reported in ref. [8].

The proposer of this project has been working on a similar project, and has the required experience in administrating the work. Preparations of the proposed project have also been undertaken, such as an investigation of the DMC method on a 2D harmonic oscillator, already presented in Fig. 2.

## BENEFITS

The project will provide students with a meaningful experience in a first-class research environment, will enable students to work closely and directly with practicing researchers, and will encourage students to develop their own “research literacy,” including familiarity with the literature, oral and written communications skills, and time management. The project will also provide insights into how DMC algorithms can be improved, and enhance our understanding of the systems investigated. Furthermore, the project will produce attractive visualizations that can be used for educational purposes.

## Budget

The main component for the budget of the proposed project is the student stipend. A student stipend of \$4000 is requested.

Most computational resources required for the completion of the proposed project are available through the Engineering Work Stations (EWS) maintained by the Campus Information Technologies and Educational Services (CITES) of the University of Illinois. The resources provided include compilers (e.g., GCC for C/C++) for compiling computer codes, high-level computer programs (e.g., Microsoft Excel and Mathematica) for analyzing the data, and computer storage space. However, since a large amount of data is expected to be generated, additional storage space for computer data is required; \$150 fund is requested for such storage space. The storage may take the form of computer hard disk, CD-ROMs, and/or storage space in network servers.

To disseminate the results obtained in the proposed project, \$600 is requested for one student's travel, to give a talk at the American Physical Society (APS) 2006 March meeting at Baltimore, MD.

The requested fund for the items listed above is summarized in the table below:

<b>Item</b>	<b>Request fund (institutional overhead excluded)</b>
Student stipend	\$4000
Storage space for computer data	\$150
Student's travel to APS March meeting	\$600

With a 43 percent institutional overhead applied to the storage space and to student travel, the total budget requested for the proposed project is \$5072.50.

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### **EDUCATION**

2001–Present: University of Illinois at Urbana-Champaign, Urbana, IL USA  
Bachelor of Science in Physics with honors expected in May 2005  
Bachelor of Science in Mathematics with honors expected in May 2005  
Overall GPA: 4.0

2000: Hong Kong Certification of Education Examination  
A in English Language (Syllabus B), Biology, Chemistry, Physics, Mathematics,  
Additional Mathematics, and Economics  
B in Chinese Language and Religious Studies

1995–2001: Diocesan Boys' School, 131 Argyle Street, Mongkok, Hong Kong

### **EMPLOYMENT**

2002–Present: *Mentor (Mathematics)*, Netmath Distance Education Program, Department  
of Mathematics, University of Illinois at Urbana-Champaign, Urbana, IL USA

Summer 2004: REU (Research Experience for Undergraduates) at the University of  
Illinois under Prof. Richard Martin, investigating the application of quantum Monte  
Carlo methods on few-electron systems

### **MEMBERSHIPS AND ACTIVITIES**

*Vice Chairman*, Science Society, Diocesan Boys' School, 2000–2001  
*Chairman*, Astronomy Club, Diocesan Boys' School, 2000–2001  
*Member*, Phi Eta Sigma National Society, University of Illinois Chapter, 2002  
*Participant*, Physics Van, University of Illinois at Urbana-Champaign, 2002–Present  
*Treasurer*, Physics Society, University of Illinois at Urbana-Champaign, 2003–Present

### **AWARDS AND HONORS**

*Dean's List*, College of Liberal Arts and Sciences, University of Illinois at Urbana-  
Champaign, Fall 2001–Spring 2004  
*James Scholar*, College of Liberal Arts and Sciences, University of Illinois at Urbana-  
Champaign, Fall 2001–Spring 2004  
*Salma Wanna Memorial Award*, Department of Mathematics, University of Illinois at  
Urbana-Champaign, 2004  
*Undergraduate Outreach Achievement Award*, Physics Department, University of Illinois  
at Urbana-Champaign, 2004  
*Lorella M. Jones Summer Research Fellowship*, Physics Department, University of  
Illinois at Urbana-Champaign, 2004