APPENDIX 1

HUMAN ETHICS APPROVAL AND DOCUMENTATION

This Appendix contains the following University of Sydney, Human Ethics Documentation (reference 99/09/21).

1. Sydney University Physics Education Research Group
   How Tertiary Level Physics and Chemistry Students
   Learn and Conceptualise Quantum Mechanics
   - Student - Subject Information Sheet
   - Student - Consent Form
   - Staff - Subject Information Sheet
   - Staff - Consent Form

2. Request for modification to protocol

3. Sydney University Physics Education Research Group
   How Tertiary Level Physics Students
   Learn and Conceptualise Quantum Mechanics
   - Student - Subject Information Sheet
   - Student - Consent Form
   - Staff - Subject Information Sheet
   - Staff - Consent Form
You are invited to take part in a research study into conceptual development in Quantum Mechanics. As the need for students to understand quantum phenomena increases, so does our need to understand the learning processes for these abstract and counterintuitive concepts. This project focuses on several research questions – “How are ‘misconceptions’ planted?”, “How do they develop?” and “Why do students find using analogies difficult?”. The projects goal is to produce formative tools that can be integrated into mainstream physics and chemistry teaching.

This aspect of the study is being conducted by three investigators Peter Fletcher, Ph.D. student, Dr Meredith Jordan of the School of Chemistry and chief investigator Associate Professor Ian Johnston, Sydney University Physics Education Research Group, School of Physics.

If you agree to participate in this study you will be interviewed. This process will take the form of a one-to-one interview or a small group discussion with one or two fellow students. The semi-structured interviews will range from 10 to 50 minutes. This interview will be videotape and/or audiotape recorded and coded transcripts will be made. The tapes will be kept by the School of Physics in a secured location for the duration of the study (approximately 2 years) then destroyed, the coded transcripts will be retained by the School of Physics for 5 years then destroyed. You have the right to view them if you choose.

All aspects of the study, including the results, will be strictly confidential and only the investigators named above will have access to information on the participants. No information obtained during this study will be used for assessment of your performance in any physics course. A report of the study maybe submitted for publication, but individual participants will not be identifiable in such a report.

Participation in this study is entirely voluntary. You are not obliged to participate and if you do participate you may withdraw at anytime. Whatever your decision it will not affect your assessment or your relationship with academic staff.

When you have read this information, Peter Fletcher or Meredith Jordan will discuss it further with you and answer any questions you have. If you would like to know more at any stage please feel free to contact Peter Fletcher on 02 9351 5982 or fletcher@physics.usyd.edu.au. This information sheet is for you to keep.

Thank you for your interest.
HOW TERTIARY LEVEL PHYSICS AND CHEMISTRY STUDENTS
LEARN AND CONCEPTUALISE QUANTUM MECHANICS

STUDENT - CONSENT FORM

I  ___________________________________________  Student ID  
Name  

agree to participate in the research project How tertiary level physics and chemistry students learn and conceptualise quantum mechanics being conducted by Peter Fletcher, Ph.D. student, contact telephone number 02 9351 5982 or fletcher@physics.usyd.edu.au and Dr Meredith Jordan School of Chemistry, contact 02 9351 2240 or m.jordan@chem.usyd.edu.au. The chief investigator is Associate Professor Ian Johnston, Sydney University Physics Education Research Group, School of Physics.

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I freely choose to participate in the study and realise that I can withdraw at any time without giving reason.

I have read and understood the material on the Information Sheet for the above named research study and have discussed it.

Signature  ___________________________  Date  ____________

Name of witness  ___________________________________________

Signature of Witness  ___________________________________________

Essential Information: Any person with concerns or complaints about the conduct of a research study can contact the Manager of Ethics and Biosafety Administration, University of Sydney on (02) 9351 4811.

You will be given a copy of this form for your record.

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Associate Professor ID Johnston, School of Physics, Phone: 02 9351 2637  Email: idj@physics.usyd.edu.au
The University of Sydney
School of Physics, A28
NSW 2006, AUSTRALIA

SYDNEY UNIVERSITY PHYSICS EDUCATION RESEARCH GROUP
HOW TERTIARY LEVEL PHYSICS AND CHEMISTRY STUDENTS
LEARN AND CONCEPTUALISE QUANTUM MECHANICS

STAFF - SUBJECT INFORMATION SHEET

You are invited to take part in a research study into conceptual development in Quantum Mechanics. As the need for students to understand quantum phenomena increases, so does our need to understand the learning processes for these abstract and counterintuitive concepts. This project focuses on several research questions – "How are 'misconceptions' planted?", "How do they develop?" and "Why do students find using analogies difficult?". The projects goal is to produce formative tools that can be integrated into mainstream physics teaching.

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Page 1 of 1

Associate Professor I D Johnston, School of Physics, Phone: 02 9351 2637 Email: idj@physics.usyd.edu.au
The University of Sydney  
School of Physics, A28  
NSW 2006, AUSTRALIA

SYDNEY UNIVERSITY PHYSICS EDUCATION RESEARCH GROUP
HOW TERTIARY LEVEL PHYSICS AND CHEMISTRY STUDENTS LEARN AND CONCEPTUALISE QUANTUM MECHANICS

STAFF - CONSENT FORM

I __________________________________________________________________________

Name

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Signature ___________________________ Date ___________________________

Name of witness ___________________________

Signature of Witness ___________________________

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Associate Professor I D Johnston, School of Physics, Phone: 02 9351 2637  Email: idj@physics.usyd.edu.au
RE : REQUEST FOR MODIFICATION TO PROTOCOL

Title: How tertiary level physics students learn and conceptualise quantum mechanics.

Ref No: 99/09/21

My research student Peter Fletcher has been recently been awarded a small grant from the Faculty of Science. His grant application included a number of co-researchers interested in his area of research, namely Dr Meredith Jordan and Dr Adrian George (Chemistry); Mr Stephen Edney (Physics); Dr Susan Gordon and Mr Michael Stewart (Mathematics).

Quantum mechanics is extensively taught in physics and chemistry, however the current protocol 99/90/21 focuses mainly on physics students studying quantum mechanics. In Peter's grant proposal he wished to include more chemistry students in the sample group to provide a better understanding of how quantum mechanics is learnt at a tertiary level.

The following amendments to the existing protocol are submitted for your consideration:

1. Explicit expansion of the sample group to include chemistry students. Changing "physics" to "physics and chemistry" in Sections 1.1, 1.5, 4.2, 5.2, 8.1 and on all Information and Consent forms.

2. The use of audiotape in interviews (currently videotape has been approved). Changing "videotape" to "videotape or audiotape" in Sections 6.2, 6.4 and on all Information and Consent forms.

3. The addition of Dr Meredith Jordan (Chemistry) to the interview process. Note only Peter Fletcher, Meredith Jordan and myself would have access to information linking informants to the transcribed data. The other research team members are only participating in the study as discipline specific experts during the analysis phase of the study. Appropriately changing Section 4.2 and on all Information and Consent forms.

Please find attached an amended Ethics Application Form for Research Involving Humans and documentation.

Yours sincerely

Ian D Johnston
SYDNEY UNIVERSITY PHYSICS EDUCATION RESEARCH GROUP

HOW TERTIARY LEVEL PHYSICS STUDENTS
LEARN AND CONCEPTUALISE QUANTUM MECHANICS

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This study is being conducted by two investigators Peter Fletcher, a Ph.D. student, under the supervision of Associate Professor Ian Johnston.

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Thank you for your interest.

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Page 1 of 1

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The University of Sydney  
School of Physics, A28  
NSW 2006, AUSTRALIA  

SYDNEY UNIVERSITY PHYSICS EDUCATION RESEARCH GROUP  
HOW TERTIARY LEVEL PHYSICS STUDENTS LEARN AND CONCEPTUALISE QUANTUM MECHANICS  
STUDENT - CONSENT FORM  

I _______________________________  
Name  

Student ID  

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Name of witness  

Signature of Witness  

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Associate Professor I D Johnston, School of Physics, Phone: 02 9351 2637  
Email: idj@physics.usyd.edu.au
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A1-10

The University of Sydney
School of Physics, A28
NSW 2006, AUSTRALIA

SYDNEY UNIVERSITY PHYSICS EDUCATION RESEARCH GROUP

HOW TERTIARY LEVEL PHYSICS STUDENTS
LEARN AND CONCEPTUALISE QUANTUM MECHANICS

STAFF - CONSENT FORM

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