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Standard Report

Document Status: In Submitter Pool

EPSRC Reference: EP/C007751/1

Scheme: Standard Research
Programme: Chemistry
Call/Type: Adventurous Chemistry

Award Holding Organisation

Organisation	University of East Anglia	Research Organisation Reference:	R13216
Division or Department	Chemical Sciences and Pharmacy		

Title of Research Project

Nanoscale and Molecular Photonics

Project Details

Start Date	01/09/2005	Duration of Grant (months)	30
End Date	29/02/2008		
Report Due Date	29/05/2008		

Funds Awarded

Description	Value
Staff	£ 115,240.00
Travel and Subsistence	£ 3,118.00
Consumables	£ 35,704.00
Equipment	£ 48,767.00
Indirect Costs	£ 53,010.00
Funds Awarded	£ 255,840.00
Grant Total	£ 255,840.00

Investigators

Role	Name	Organisation	Division or Department
Principal Investigator	Professor SR Meech	University of East Anglia	Chemical Sciences and Pharmacy
Co-Investigator	Professor DL Andrews	University of East Anglia	Chemical Sciences and Pharmacy

Co-Investigator	Dr AN Cammidge	University of East Anglia	Chemical Sciences and Pharmacy
Co-Investigator	Dr GR Stephenson	University of East Anglia	Chemical Sciences and Pharmacy
Co-Investigator	Dr AG Mayes	University of East Anglia	Chemical Sciences and Pharmacy
Co-Investigator	Professor M Reading	University of East Anglia	Chemical Sciences and Pharmacy
Co-Investigator	Dr SA Barker	University of East Anglia	Chemical Sciences and Pharmacy

Objectives

The main objectives of the research [up to 4000 chars] at proposal time

To initiate a highly adventurous series of interlinked research projects in the area of nanophotonics, biophotonics and material science. Specifically

1. The development of an entirely novel photothermal scanning probe microscope.
2. The development of wide field single molecule spectroscopy, sensitive to the local structure, for applications in membrane transport and drug delivery.
3. The development of entirely new methods of optically switching the liquid crystal response, using structured beams and novel photochemical transformations.
4. The development of novel optical methods to enable the shift from organic molecules with high optical nonlinearities to organic molecular devices with useful nonlinear optical properties.

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1. The development of an entirely novel photothermal scanning probe microscope.
2. The development of wide field single molecule spectroscopy, sensitive to the local structure, for applications in membrane transport and drug delivery.
3. The development of entirely new methods of optically switching the liquid crystal response, using structured beams and novel photochemical transformations.
4. To assess feasibility of new synthesis protocols resulting from serendipitous discoveries.

Summary

The research described in simple terms in a way that it could be publicised to a general audience. [up to 4000 chars]

Proposal time

One of the key challenges facing modern society is how to support global improvements in living standards, given the limited resources of the planet. Technology can offer as its response to this challenge the possibility of dramatic reductions in power consumption. This can be achieved through improved materials performance and greater miniaturisation (nanotechnology). Innovation in chemistry has an essential role to play in both areas, and each area is addressed in the projects proposed here.

To investigate materials at the nanoscale we must have tools to see - to image - those materials. The question is, what property are you actually imaging? In a microscope (good at the microscale) you are imaging light scattering by interfaces in your sample. Existing nanoscale imaging tools generally image forces between the microscope and the sample - atomic force microscopy. This has limitations; in particular it is not very good in 3D. The photothermal imaging tool we will develop is capable of imaging the absorption of radiation with nm resolution, and doing it in 3D. A number of important applications of this tool are described.

Modern detectors have the possibility of imaging light emitted by single molecules. This is a great advantage compared to old methods which looked at many molecules. When we are looking at systems which are very mixed up many molecules just give an average result - a mush. By studying the properties of the light emitted by single molecules we can draw some conclusions about the environment in which the molecule is sitting, again allowing us to probe sample properties at the nanoscale. This is a particularly powerful methodology when investigating single molecules interacting with very complicated systems, such as the cells that make up our body. We see important applications for this single molecule method in understanding drug molecule binding to membranes.

Liquid crystal displays represent a great step forward compared with the old cathode ray tube. They use less material and consume less energy. However, they are still controlled by attachment to electrodes. Further steps forward in miniaturisation and power consumption could be made if the liquid crystal could be controlled by light rather than electricity. The projects outlined below propose potential routes to this goal, by using light to induce a change in shape of a molecule in the liquid crystal, which then causes the crystal to switch in the same way as an applied electric field.

Underpinning many of the important applications of laser light is the ability to change its wavelength. For example an invisible laser at infra red wavelengths does not make a very good indicator light, but by halving its wavelength to the visible region it becomes highly visible. The effect is one of a class called nonlinear optical interactions. For this to be useful the material supporting the nonlinear interaction must be cheap, give a large effect (be efficient) and highly ordered in one direction. Chemists have shown that organic, and especially organometallic materials in polymers are much cheaper and more efficient than inorganic compounds, and yet the latter are always preferred because that are relatively easily ordered. The program we describe will allow us to overcome this last barrier to exploiting organic materials in nonlinear optical devices.

Report time

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Add web address :

Beneficiaries

Nanoscale photothermal imaging will be of very wide application. It provides data on structure at the nanoscale, but images optical absorption, thus providing a level of contrast not available from AFM. Essentially any coloured nanostructured material can be imaged, and applications in pharmacy and material science have been identified.

Wide angle single molecule measurements will provide novel data on the dynamics of inhomogeneous media. Data will be of interest to groups modeling the chemical physics of complex media. We have identified an important application in unravelling the mechanism of drug binding and transport in biological membranes.

Liquid crystal displays are of huge economic importance. The invention of a means of remotely addressing liquid crystals, through optical irradiation, could be of immense benefit to all sides of the electronics industry.

Over the past 10 years synthetic chemists have generated organic molecules with extremely large optical nonlinearities. The challenge now is to convert these to active devices. A program combining zoned holography with chemical synthesis offers a route to this goal which will have very wide application in optoelectronics industry.

Follow on Support

Awarding Organisation	Application Reference	Title of Project	Decision Made	Award Made	Start Date	End Date	Amount Sought / Awarded (£)
EPSRC [Research Council / Research Council Institute]	EP/G001162/1	Nanoscale IR Tomography	No	No	08/08/2008	07/08/2010	476547

Staff

Role Name	Name / Post Identifier	Duration	% FTE	Gender	Qualifications gained on project
Researcher	Dr James Rice	24	100	Male	
Researcher	Dr Victoria Goddard	24	100	Female	

Staff Destinations

Name	Organisation details	Employment type
Dr James Rice	University College Dublin Ireland	Higher Education - Academic (usually training and research)
Dr Victoria Goddard	Baxter Health Care Ltd Way, Thetford, Norfolk, U.K. United Kingdom	Private sector, industry or commerce - research related

Publication Summary

	Journal	Refereed Journal	Conference Proceedings	Book	Other
Total	0	3	1	0	0
Number of Reviewed (if different from above)	0	0	0	0	0
Total with Industrial Co-Author	0	0	0	0	0
Total with International Co-Author	0	1	0	0	0

Publications

Type	Title	Author(s)	Reference				Reviewed	Internationa l Co-Author	Industrial Co-Author
			Name	Year	Vol.	Page			
Journal	Aryl trihydroxy borates: easily isolated discreet species convenient for direct application in coupling reactions	Dr Andrew Cammidge Dr Victoria Goddard Mr Chris Schubert Dr Hemant Gopee Dr Ben Sutton Dr Andrew Whitehead	Org Lett	2006	8	4071	Yes	No	Yes
Journal	Chemical mapping with nanometre resolution using IR absorption	Dr James Rice Dr Graham Hill Professor k Vodopyanov Dr Pauline Kuo Professor Stephen Meech Professor Michael Reading	Optics Letters	2009	Accepted	Embargoed	Yes	Yes	No
Journal	Fluorescence microscopy beyond the diffraction limit: fluorescence imaging with ultrahigh resolution	Dr James Rice	Molecular BioSystems	2007	3	781	Yes	No	No
Conference	2,6-Disubstituted anthracenes: their synthesis and liquid crystal properties	Dr Andrew Cammidge Dr Victoria Goddard	ECLC2007	2007	-	PA7	No	No	No

Licences, Options and Agreements

Licence Details	Business Sector	Software
The company Anasys Instruments is in discussion with UEA on the IP associated with the nanoscale photothermal imaging project. An agreement covering IPR is now in place and individual patents are being reviewed	Technical Consultancy and R&D	No

Other Research Outputs

Category	Details	Reference
Direct Consultancy		
Industrial Training Courses		

Revenue

Please estimate the total value raised from the Intellectual Property generated through the grant (£)

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Grant Conditions

SCHEME CONDITIONS

RGC: Research Grants

: TERMS AND CONDITIONS OF RESEARCH COUNCIL GRANTS

Research Grants awarded by the following Research Councils and the Arts and Humanities Research Board are made to Research Organisations on the basis of this single set of core terms and conditions:

Biotechnology and Biological Sciences Research Council (BBSRC)

Economic and Social Research Council (ESRC)

Engineering and Physical Sciences Research Council (EPSRC)

Medical Research Council (MRC)

Natural Environment Research Council (NERC)

Particle Physics and Astronomy Research Council (PPARC)

Arts and Humanities Research Board (AHRB)

Individual Councils may add additional conditions to the grant to reflect the particular circumstances and requirements of their organisation, or the nature of a particular grant. Acceptance of a research grant constitutes acceptance of both the core conditions and any additional conditions.

The Research Councils reserve the right to vary these terms and conditions.

Definitions

Dipstick Testing: A programme of visits and office-based tests to seek assurance that research grant funds are used for the purpose for which they are given and that grants are managed in accordance with the terms and conditions under which they are awarded.

Investigator: the generic term used to identify the individual member of staff to whom the research project is assigned. The Principal Investigator takes responsibility for the intellectual leadership of the research project and for the overall management of the research.

Large Capital: items of equipment above a threshold value set by the individual Research Council and specified in the grant. Large capital items are not paid by profiled payments; they require claims to be submitted.

Research Council: any of the bodies listed above, including the Arts and Humanities Research Board.

Research Grant: a contribution to the costs of a stated research project which has been assessed as suitable for funding through the procedures established by the relevant Research Council. Research Grants provide for the eligible direct costs of the research, plus a contribution to indirect costs.

Research Organisation: the organisation to which the research grant is awarded and which takes responsibility for the management of the research project and the accountability of funds provided.

References in these terms and conditions to statutory provisions and guidance include any subsequent amendments or re-enactments.

Data Protection Act

The Research Councils will use information provided on the research grant proposal form for processing the proposal, the award of any consequential grant, and for the payment, maintenance and review of the grant. This may include:

Registration of proposals;

Operation of grants processing and management information systems;

Preparation of material for use by referees and peer review panels;

Statistical analysis in relation to the evaluation of research and the study of trends;

Policy and strategy studies.

To meet the Research Councils' obligations for public accountability and the dissemination of information, details of research grants may also be made available on the Research Councils' web sites and other publicly available databases, and in reports, documents and mailing lists.

RG 1 Responsibilities of the Research Organisation

The Research Organisation must provide the infrastructure needed to carry out the research, together with any specific contributions identified in the application.

The Research Organisation must ensure that Investigators are made aware of their responsibilities and that they observe the terms and conditions of research grants.

The Research Organisation must ensure that the research supported by the grant complies with all relevant legislation and Government regulation, including that introduced while work is in progress. This requirement includes approval or licence from any regulatory body that may be required before the research can commence.

The Research Organisation is expected to adopt the principles, standards and good practice for the management of research staff set out in the 1996 Concordat for the Career Management of Contract Research Staff, and subsequent amendments.

The Research Organisation must notify the Research Council of any change in its status, or that of any of the investigators, that might affect the eligibility to hold a research grant.

The Research Organisation must ensure that the requirements of the Employing Organisation under the Department of Health's Research Governance Framework for Health and Social Care are met for research involving NHS patients, their organs, tissues or data, and that the necessary arrangements are in place with partner organisations. Where it also accepts the responsibilities of a Sponsor (as defined in the Governance Framework), it must also ensure that the requirements for Sponsors are met.

The Research Organisation must ensure proper financial management of research grants and accountability for the use of public funds.

RG 2 Research Governance

It is the responsibility of the Research Organisation to ensure that the research is organised and undertaken within a framework of best practice that recognises the various factors that may influence or impact on a research project. Particular requirements are to ensure that all necessary permissions are obtained before the research begins, and that there is clarity of role and responsibility among the research team and with any collaborators. The Research Councils expect research to be conducted in accordance with the highest standards of scientific integrity and research methodology.

Research Ethics

The Research Organisation is responsible for ensuring that ethical issues relating to the research project are identified and brought to the attention of the relevant approval or regulatory body. Approval to undertake the research must be granted before any work requiring approval begins. Ethical issues should be interpreted broadly and may encompass, among other things, the involvement of human participants in research, the use of animals, research that may result in damage to the environment and the use of sensitive economic, social or personal data.

Use of Animals in Research

Wherever possible, researchers must adopt procedures and techniques that avoid the use of animals. Where this is not possible, the research should be designed so that:

The least sentient species with the appropriate physiology is used;

The number of animals used is the minimum sufficient to provide adequate statistical power to answer the question posed;

The severity of procedures performed on animals is kept to a minimum. Experiments should be kept as short as possible. Appropriate anaesthesia, analgesia and humane end points should be used to minimise any pain and suffering.

The provisions of the Animals (Scientific Procedures) Act 1986, and any amendments, must be observed and all necessary licences must have been received before any work requiring approval takes place.

Medical and Health Research

The Research Organisation is responsible for managing and monitoring the conduct of medical and health research in a manner consistent with the Department of Health's Research Governance Framework for Health and Social Care. There must be effective and verifiable systems in place for managing research quality, progress and the safety and well-being of patients and other research participants. These systems must promote and maintain the relevant codes of practice and all relevant statutory review, authorisation and reporting requirements.

Health-related research within the social sciences that falls outside the Department of Health's Research Governance Framework must meet the provisions and guidelines of the ESRC's Research Ethics Framework. While this research may involve patients, NHS staff or organisations, it is defined as research that poses no clinical risk or harm to those who are the subjects of research. Research Organisations must ensure that appropriate arrangements are in place for independent ethics review of social science research that meet local research ethics committee standards.

Significant developments must be assessed as the research proceeds, especially those that affect safety and well-being, which should be reported to the appropriate authorities and to the Research Council. The Research Organisation must take appropriate and timely action when significant problems are identified. This may include temporarily suspending or terminating the research.

The Research Organisation is responsible for managing and monitoring statutory requirements for which it accepts responsibility, for example, in relation to legislation on clinical trials, use of human organs, tissues and data.

Guidance by the MRC on the conduct of medical research, and by ESRC on the conduct of social science research, provided on behalf of all Research Councils, must be observed.

Health and Safety

The Research Organisation is responsible for ensuring that a safe working environment is provided for all individuals associated with a research project. Its approach and policy on health and safety matters must meet all regulatory and legislative requirements and be consistent with best practice

recommended by the Health & Safety Executive. Appropriate care must be taken where researchers are working off-site. The Research Organisation must satisfy itself that all reasonable health and safety factors are addressed. The Research Councils reserve the right to require the Research Organisation to undertake a safety risk assessment in individual cases where health and safety is an issue, and to monitor and audit the actual arrangements made.

Misconduct and Conflicts of Interest

The Research Organisation is required to have in place procedures for governing good research practice that meet the requirements of the Research Councils' guidance on good practice. The Research Organisation must ensure that there are reliable systems and processes in place for the prevention of research misconduct e.g. plagiarism, falsification of data, together with well-defined and clearly-publicised arrangements for investigating and resolving allegations of misconduct. Where an allegation of misconduct arises in respect of a researcher supported by a research grant, the Research Council must be informed immediately and notified of the outcome of any investigation.

The Research Organisation must ensure that potential conflicts of interest in research are declared and subsequently managed.

RG 3 Use of Funds

Subject to the following conditions, grant funds may be deployed to meet eligible research costs, without reference to the Research Council, in such a manner as to best carry out the research. Research grant funds are cash limited and the grant is made on the understanding that its value will not be increased, except as stated in these terms and conditions. Research grant funds are provided to sustain a specific research project. Under no circumstances may funds be used to meet costs incurred by any other project or activity.

RG 4 Starting Procedures

The start of a research grant is defined as the date on which the first member of staff paid from the grant starts work, or, if there are no staff or if staff are intended to commence later in the project, the date on which expenditure under another heading is first incurred.

Notification of this date, by submission of the starting certificate, will constitute acceptance of the grant and will activate the profiled payments. Submission of the starting certificate is required not more than 28 days after the actual start date. A separate acceptance letter may be required in certain circumstances.

The start of research may be delayed by up to 6 months (ESRC and AHRB 3 months) after the start date stated in the award letter, the duration of the grant remaining unchanged. The grant may lapse if not started within this period.

RG 5 Changes in Research Project

The Research Council must be consulted in the event of any major change in the proposed research, including failure to gain access to research facilities and services, particularly those which make it unlikely that the objectives of the research can be achieved. If appropriate, revised proposals may be required. The Research Council reserves the right to make a new grant in place of the existing grant, or to revise, retain or terminate the existing grant.

RG 6 Transfers between Headings

The Research Organisation may increase the amounts within individual headings of expenditure by transfer from another heading, subject to the following restrictions:

Indirect costs cannot be transferred;

Funds provided for Large Capital, or savings on the purchase of such items, are not transferable without prior written approval;

If the staff heading is increased by transfer from another heading, proportional funds must also be transferred to the indirect costs heading.

RG 7 Extensions

After a research grant has started, the duration may be extended by a total of up to 6 months, subject to prior written approval. Extensions may cover breaks or delays in the appointment of staff, periods of maternity leave or paid sick leave exceeding 3 months for staff funded by the grant, or other exceptional circumstances with the agreement of the Research Council. Requests for extensions should be made as soon as the requirement is identified and confirmed when the period required is known. All requests for extensions must be made before the grant ends.

RG 8 Staff

The Research Organisation must assume full responsibility for staff funded through research grants and, in consequence, accept all duties owed to and responsibilities for these staff, including, without limitation, their terms and conditions of employment and their training and supervision, arising from the employer/employee relationship. Staff must be appointed on terms that are no less favourable than those of comparable posts in the Research Organisation.

The Research Organisation must provide research staff with a statement, at the outset of their employment, setting out the provisions for career management and development, including personal skills training.

Research staff may undertake teaching and demonstrating work for up to 6 hours a week (pro rata for part-time staff) during normal working hours provided that this work is related to the research project to which they were appointed.

RG 9 Maternity Pay and Leave

Research grant funds may be used to fund paid maternity leave if staff fulfil the qualifying conditions of the Research Organisation. Funding may be sought at the end of a grant to cover the additional costs of either a substitute appointment or an extension of the grant. The salary of any substitute appointment must not exceed that of the individual on maternity leave. Similar provisions will apply in respect of paternity leave.

Research grant funds may be used to provide paid maternity and paternity leave only to the extent that it is taken during the original period of the grant. The Research Organisation will be responsible for any liability for maternity and paternity pay for staff supported by the research grant outside the original period of the grant. If, for example, a research grant ends while a member of research staff is part-way through her maternity leave, the Research Organisation will be responsible for that part of the maternity leave which is taken after the research grant has ended.

RG 10 Sick Leave

During the period of the research grant, funds may be used to provide paid sick leave to staff supported by a research grant who fulfil the qualifying conditions of the Research Organisation. Where there is a continuous period of sick leave in excess of 3 months, the Research Organisation may apply to the Research Council to discuss the possibility of a substitute appointment to safeguard progress on the project, or an extension to the duration of the project, if the period of leave can be predicted.

For the purposes of the provisions of RG 9 and RG 10, the Research Organisation will be compensated at the end of the grant for any additional costs or time resulting from maternity leave, paternity leave or sick leave, falling within the original period of the grant. The duration of a grant will be extended only if the period can be accommodated within the maximum period allowed for extensions.

RG 11 Procurement of Equipment

The procurement of equipment and services must comply with all relevant national and EU legislation and the Research Organisation's own financial policy. Accepted procurement best practice in the higher education sector must be observed. For all equipment costing more than 25,000, professionally qualified procurement staff must be consulted at the beginning of the procurement process and must approve the order before it is placed with a supplier.

RG 12 Ownership and Use of Equipment

Equipment is provided primarily for use on the research project for which the research grant was awarded, and belongs to the Research Organisation. In certain circumstances the Research Council may wish to retain ownership throughout the period of the grant and possibly beyond. In such cases, the grant will be subject to an additional condition.

The Research Council must be informed if, during the life of the research grant, the need for the equipment diminishes substantially or it is not used for the purpose for which it was funded. The Research Council reserves the right to determine the disposal of such equipment and to claim the proceeds of any sale.

Any proposal to transfer ownership of the equipment during the period of the grant is subject to prior approval by the Research Council. After the research has ended, the Research Organisation is free to use the equipment without reference to the Research Council, but it is nevertheless expected to maintain it for research purposes as long as is practicable.

Where there is spare capacity in the use of the equipment, the Research Council expects this to be made available to other users. Priority should be given to research supported by any of the Research Councils and to Research Council-funded students.

RG 13 Claims for Large Capital Equipment

Claims are required for major purchases of equipment at a level set by the individual Research Council and specified in the grant. In such cases, claims must be submitted in arrears. Submission of large capital claims should normally be made within a year of the start date of the grant and must be accompanied by an invoice for the relevant equipment. Reimbursement will be limited to the actual price paid, within the awarded value. Savings on the purchase cost of large capital equipment may be used elsewhere in the grant subject to prior approval.

RG 14 Transfer of a Grant

The Research Organisation must notify the Research Council if the Principal Investigator intends to transfer to another organisation. If this organisation is eligible to hold research grants, and is able to provide a suitable environment to enable the project to be successfully completed, the expectation is that the grant would be transferred with the investigator. Written agreement to this is required from both the relinquishing and receiving organisations.

The Research Council will wish to be assured that satisfactory arrangements have been agreed that will enable the project to be undertaken, or to continue, in accordance with its research objectives. If suitable arrangements cannot be agreed, the Research Council will consider withdrawing its offer of support or terminating the grant.

Where there is a basis for continuing involvement by the relinquishing organisation, agreement should be reached between both organisations on the apportionment of work and the distribution of related funding.

RG 15 Change of Principal Investigator

The Research Organisation must consult the Research Council if it is proposed to change the Principal Investigator, for example, following retirement or resignation. Where the Principal Investigator is transferring to another organisation eligible to hold a research grant, the provisions of RG 15 will apply. In other circumstances, the Research Organisation may nominate a replacement Principal Investigator. The Research Council will wish to be assured that the replacement meets the eligibility criteria for Principal Investigators and has the expertise and experience to lead the project to a successful conclusion, in accordance with its research objectives.

RG 16 Annual Statement

The Research Organisation may be required to return a statement each year showing payments made by the Research Council during the previous financial year for all the research grants it holds. Where a statement is required, the Research Organisation must certify, by signing and returning the statement, that:

Expenditure has been incurred in accordance with the grant conditions, and those grants shown as current are continuing.

No further payments will be made until the signed annual statement has been received by the Research Council.

RG 17 Expenditure Statements

The Research Organisation must complete and return an expenditure statement within 3 months of the end date of a research grant. Once an expenditure statement has been received and the expenditure incurred has been reconciled against payments made, it will be considered as final.

Costs arising from maternity leave or sick leave should be identified in the exceptional items heading of the statement.

The Research Council reserves the right to require the Research Organisation to complete and submit a statement of expenditure at any time during the course of a research grant, or to provide supplementary information in support of an interim or final expenditure statement.

RG 18 Inspection

The Research Council reserves the right to have reasonable access to inspect the records and financial procedures associated with research grants or to appoint any other body or individual for the purpose of such inspection.

The Research Organisation must, if required by the Research Council, provide a statement of account for the grant, independently examined by an auditor who is a member of a recognised professional body, certifying that the expenditure has been incurred in accordance with the research grant terms and conditions.

Research Councils will undertake periodic reviews of Research Organisations within the Dipstick Testing programme to seek assurance that research grants are managed in accordance with the terms and conditions under which they are awarded.

RG 19 Final Report

A report on the conduct and outcome of the project must be submitted by the Research Organisation within three months of the end of the research grant, on the form provided. No further application from a Principal Investigator will be considered while a final report is overdue.

If there are exceptional reasons that will prevent submission of the final report within the period allowed, a written request may be made, before the due date passes, for the submission period to be extended.

RG 20 Sanctions

If the final report or the final expenditure statement is not received within the period allowed, the Research Council may recover 20% of expenditure incurred on the grant. All payments made by the Research Council may be recovered if the report or statement is not received within 6 months of the end of the grant.

RG 21 Public Engagement

It is the responsibility of the Research Organisation and the Investigators to actively communicate the research to the public at both local and national level, and to raise awareness of the role of science and research in any related issues of public interest. Special schemes exist in some Research Councils providing additional support for these activities, or earmarked funding may be provided in the grant for this purpose.

RG 22 Commercial Exploitation

Unless stated otherwise, the ownership of intellectual property, and responsibility for its exploitation, rests with the Research Organisation. The Research Council may, in individual cases, reserve the right to retain ownership of intellectual property and to arrange for it to be exploited for the national benefit and that of the Research Organisation involved. This right, if exercised, will be set out in an additional condition.

It is the responsibility of the Research Organisation, and all engaged in the research, to make every effort to ensure that any potentially valuable results obtained in the course of the research are exploited, and that there is a suitable return to the Research Organisation and the researchers from any such exploitation. The Research Organisation must ensure that all those associated with the research are aware of, and accept, the arrangements for exploitation.

Collaborative arrangements are expected to be put on a formal basis through an agreement covering the contributions and rights of the organisations and individuals concerning exploitation. Such agreements must be in place before the research begins. The terms of collaboration agreements must not conflict with the Research Councils' terms and conditions of research grants.

RG 23 Research Monitoring and Evaluation

While it is the responsibility of the Research Organisation and the Investigator to manage the research, the Research Council reserves the right to call for periodic information on progress or to visit the Investigator. The Investigator may also be asked to attend meetings to exchange information and ideas with others undertaking research in the same or similar fields.

The Investigator must make all reasonable efforts, if so invited, to attend events or activities organised by the Research Council concerning the research undertaken. Such events may be held after a grant has finished.

RG 24 Publication and Acknowledgement of Support

The Investigator should, subject to the procedures laid down by the Research Organisation, publish the results of the research in accordance with normal academic practice. Publications and other forms of media communication, including media appearances, press releases and conferences, must acknowledge the support received from the Research Council, quoting the grant reference number.

RG 25 Disclaimer

The Research Councils accept no liability, financial or otherwise, for expenditure or liability arising from the research funded by the research grant, except as set out in these terms and conditions, or otherwise agreed in writing.

Where studies are carried out in an NHS Trust, the Trust has a duty of care to its patients. The Research Council does not accept liability for any failure in the Trust's duty of care, or any negligence on the part of its employees.

The Research Councils reserve the right to terminate the grant at any time, subject to reasonable notice and to any payment that may be necessary to cover outstanding and unavoidable commitments.

If a grant is terminated, no liability for payment or redundancy or any other compensatory payment for the dismissal of staff funded by the grant will be accepted, but negotiations will be held with regard to other contractual commitments and concerning the disposal of assets acquired under the research grant.

RG 26 Status

These terms and conditions will be governed by the laws of England and Wales; all matters relating to the terms and conditions will be subject to the exclusive jurisdiction of the courts of England and Wales.

If any provision of these terms and conditions is found by a court or other legitimate body to be illegal, invalid or unreasonable, it will not affect the remaining terms and conditions which will continue in force.

These terms and conditions, together with any additional conditions set out in the grant, contain the whole agreement between the Research Council and the Research Organisation in relation to the stated research grant. The Research Council and the Research Organisation do not intend that any of these terms and conditions should be enforceable by any third party.



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16 May 2008

Professor Michael Reading
University of East Anglia

To Whom it may Concern:

RE: Photothermal Imaging Research conducted by Prof. Reading's group at UEA

This letter is confirm that the research performed by Prof. Reading and his collaborators at the University of East Anglia on Photothermal imaging is an exciting major advance and we are actively engaged with UEA to further this work and protect and acquire the IP. As part of this process, we have requested that no articles be published at this time.

Sincerely Yours

A handwritten signature in black ink, appearing to read 'R Shetty', with a long vertical line extending downwards from the end of the signature.

Roshan Shetty
CEO