Module 3: Conducting Research Responsibly – Protecting Yourself, Your Research, and Your University

Introduction

As a researcher, you are bound by significant governance expectations, responsible research practices, and the need to comply with statutes and regulations. This module examines the context in which research operates and the resultant requirements for research practice. The need to operate within a university-specific framework of governance, responsible research practice, and statutory and regulatory requirements is also explored. You will have an opportunity to explore the nature of compliance as a partnership in research governance, rather than an imposed requirement. In all disciplines across universities, researchers enjoy important academic freedoms and privileges, including freedom of inquiry, the right to disseminate the results of research inquiry, freedom to challenge conventional thought, and the privilege of conducting research in areas requiring public trust and support. With this freedom comes the responsibility to ensure that the research meets the highest scientific and ethical standards. Ideally, integrity and experience combine in good research and great research leaders.

The module provides you with an overview of the ethical landscape in higher education. It is not intended to offer a full coverage of all issues and processes. Should you require specific guidance you should contact your research or legal office within your university.

This module comprises online learning material and a workshop.

You are expected to devote time to reading the online material and carrying out compulsory activities before attending the workshop. This module should take 4 hours to read and to complete the compulsory activities.

The workshop is based on the assumption that you have completed the reading and carried out the compulsory activities.

Aims

This module considers responsible conduct in research and explores how you can take maximum advantage of your university's governance and compliance requirements to build research strength and leadership. It aims to give you an understanding of the trust placed in people and in institutions that conduct research. You will also gain an appreciation that robust research requires integrity – embodied in a commitment to intellectual honesty and personal responsibility for one's actions.

Learning outcomes

After completing this module you should be able to:

- Locate and recognise the codes of conduct for research that prescribe standards of work performance and ethical conduct expected of all persons engaged in research
- Understand the responsibilities of grant-holders
- Recognise the obligations to the university and community in undertaking publicly-funded and sponsored research
- Describe the situations where research requires approval by an ethics committee, safety committee, or other regulatory committee or authority
- Define what constitutes a failure to conduct research responsibly and major forms of research misconduct
- Identify key sources of information, advice, and further education on specific issues relating to research conduct.

Content overview

The module comprises the following topics:

Topic 1: The research context

In research, as within any community, there are relationships in which obligations can be defined. In many instances, compliance with existing guidelines and codes will be all that is necessary for ethically responsible research. However, on many occasions, we are required to bring a personal integrity to the application of guidelines and codes and to consider those with whom we have a research relationship. These relationships, and how they can impinge on institutional and personal reputation, are investigated.

Topic 2: Grant-holder responsibilities

The obligations associated with receiving and using public research funding are explored. How these obligations are carried out can often strengthen research and a researcher's standing in the eyes of the funding body and the public. Whether the expectations of publicly- or privately-funded research require different grant-holder considerations is examined.

Topic 3: Research integrity

Often one of the most striking things noticed about ethical breaches in the wider community is that those responsible are often considered good people. In the research context we tell ourselves that we would always 'do the right thing', as the major misconducts of falsification, fabrication, and plagiarism are easily identified. Yet you may need a strong personal integrity to develop everyday working practices that are not overwhelmed when a sticky situation arises. The ways in which a research leader can pursue and promote research integrity will be expanded.

Topic 4: Managing your research records

Research reputation relies strongly on how research findings are distributed and the trust that can be held in the process of acquiring the data and retaining it for the benefit of future research and research participants. The topic explores the obligations of a research leader to pursue and promote research integrity through preserving and archiving research records and data. The particular requirements of cross-institutional research, or researchers with joint appointments or other collaborative arrangements, are also explored.

Topic 5: Other governance and compliance issues

We use personal integrity and guidelines to meet many governance requirements and so maintain an ethical and robust research community. Through compliance we meet the requirements of the law relating to our activities. As a research leader you should be aware of all compliance aspects related to your research and recognise these as an integrated way of working fairly, safely, and responsibly. How to avoid – by attention to compliance aspects – the serious consequences of injury, physical or financial damage, or damage to reputation will be outlined.

Workshop details

There will be a 4-hour workshop associated with this module.

At your University

Acknowledgements

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Accessing the module material

Now that you have read the module introduction you can access and navigate your way through the module content via the Module 3 Organiser link in the navigation bar at the top left of this page or in the bar below.

If you wish to print this page you can generate a pdf file via this printer icon []. A pdf file for each topic in this module can be generated using the printer icon to the left of each topic title on the Organiser page.

Module 3: Conducting Research Responsibly - Protecting Yourself, Your Research and Your University

Organiser

Topic	Subtopics	Activities	At your University
Introduction			At your University
1. The research context	1.1 Reputation management		At your University 1
	1.2 The international context		
	1.3 The Australian Code for the Responsible Conduct of Research		
	1.4 Working within university protocols and maintaining good relations with relevant university agencies	"Who gets hurt?" – Safeguarding the Murray-Darling case study activity 1 List of research opportunities	
2. Grant-holder responsibilities	2.1 Expectations of funding bodies		At your University 2
	2.2 Administering research funds		
	2.3 Maintaining accountability	"Juggling the funds" – Safeguarding the Murray–Darling case study, activity 2	
	2.4 Recognising conflict of interest	Identifying a conflict of interest	
3 Research integrity	3.1 Research integrity		At your University 3 At your University 3.1
	3.2 Publication and dissemination of research findings		At your University 3.2
	3.3 Authorship	"Who is an author?" – Safeguarding the Murray-Darling case study activity 3 "Who is an author 2?" – Safeguarding the Murray-Darling case study activity 4	At your University 3.3
	3.4 Ethics and biosafety clearances and committees		At your University 3.4
	3.5 Research misconduct and questionable research practices	"Correcting an error" – Safeguarding the Murray-Darling case study activity 5	
	3.6 Research confidentiality		
	3.7 Ethical funding		
4 Managing your research records	4.1 Responsible record keeping		
	4.2 Research data access and sharing		
	4.3 Research data ownership		
	4.4 Retaining research data		
	4.5 Electronic data	"Who gets the data?" – Safeguarding the Murray-Darling case study activity 6 "The data has flown?" – Safeguarding the Murray-Darling case study activity 7	
	4.6 Collaborative research		
	4.7 Data management planning		At your University 4.7
5 Knowledge capture and preservation	5.1 Regulatory approvals		At your University 5.1
	5.2 Higher degree supervision		At your University 5.2
	5.3 Hands-on or hands-off? What will work for you?	"The engineering 'star'" – Safeguarding the Murray-Darling case study activity 8	

Module review and completion	Frequently asked questions		
	Checklist		
	Record of completion	Guided conversation The instructions for the guided conversation are in the Record of completion.	At your University

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Topic 1: The research context

Many of the decisions a researcher makes in their day-to-day research activities are pragmatic and involve the use of data as facts to be interpreted on the basis of established knowledge and accepted practices. Examples of written guidance available to researchers in decision-making are: codes of ethical conduct in research involving human subjects and in the use of animals in research, institutional codes of conduct, codes of conduct for professional societies, and instructions to authors published by the editors of scholarly journals. However, there are times when you find that you will need to use reasoning to decide what is right or fair in a situation. In the research context you are expected to give priority to ethical values above other personal values. For example, you may often join your fellow researchers in complaining that it is not fair that you have to work so hard to be recognised as an upcoming research leader but while the expectations on you are many, the consequences of choosing a less-than-ethical means to recognition and of misconduct would be far reaching.

Learning outcomes

After completing this module you should be able to:

- Understand why research reputation is important
- Understand the international context of research integrity
- Demonstrate familiarity with the *Australian Code for the Responsible Conduct of Research*
- Explain the notion of research compliance and its support of responsible research.

Topic content

Read the following notes.
1.1 Reputation management – the university, research project, and yourself as the researcher
1.2 The international context
1.3 The *Australian Code for the Responsible Conduct of Research*
1.4 Working within university protocols and maintaining good relations with the relevant university agencies

At your University

Pursuing the topic further

Engaging with this material (and the material in other sections of the module under the same heading) is optional. However, if you wish to gain a deeper understanding of the topic you may find the following material useful.

The Office of Research Integrity (ORI) in the US Department of Health and Human Services has a number of downloadable resources from the front page. The ORI web page on case studies summarises closed inquiries and investigationsinto allegations of research misconduct. The handbook *ORI Introduction to the Responsible Conduct of Research* introduces the reader to research integrity issues involved in research – from inception to planning, conducting, reporting, and reviewing.

The European Science Foundation (ESF) has developed a *European Code of Conduct for Research Integrity* (2011) which has received support from the All European Academies. This code can be read on line here:

http://www.allea.org/Content/ALLEA/Scientific%20Integrity/A%20European%20Code%20of%20Conduct%20for%20Research%20Integrity_final.10.10.pdf

Anderson, M. S. and Steneck, N. H. (editors). (2011). International Research Collaborations: Much to be Gained, Many Ways to Get in Trouble. New York: Routledge.

National Academies Press. (2002). *Integrity in Scientific Research: Creating an Environment That Promotes Responsible Conduct*, can be read online http://www.nap.edu/catalog.php?record_id=1864#toc.

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1.1 Reputation management – the university, research, project and yourself as the researcher

Society's trust placed in research should be earned. It is worth considering how research achievements are reported with a look at the following excerpts describing a recent well-deserved award [full report on the Department of Industry website]. https://grants.innovation.gov.au/SciencePrize/Pages/Doc.aspx?name=previous_winners/MM2007Cassidy.htm

"For his leadership in offshore civil engineering, **Professor Mark Cassidy** receives the Malcolm McIntosh Prize for Physical Scientist of the Year. ... From his geotechnical laboratory at the **University of Western Australia**, he models the way the feet of these giant platforms push into the mud on the ocean floor. And his models work. His advice is sought by the **designers and builders of the platforms** and his modeling has led to changes to international safety guidelines. ... Today, Mark's newer, more sophisticated mathematical models take into account the impact of soil and wave mechanics, structural mechanics and more. Scaled-down versions of platforms' legs and feet are tested using giant centrifuges at his laboratory at the Centre for Offshore Foundation Systems at the University of Western Australia. ... He is leading **an $11 million CSIRO Flagship cluster** that's bringing **six universities** together to investigate the challenges of constructing pipelines that will carry oil and gas from depths of three kilometres or more. ... The pipelines will have to cope with rugged terrain including deep sea cliffs, ocean currents, a moving seabed, and many other hazards. **Mark and his colleagues** will assess the hazards, build the scale models and create their mathematical equivalents – **sets of numbers that engineers can use** to safely design innovative engineering solutions to meet the challenges ahead."

This reporting and much of the coverage of research shows the reputation links a researcher can have. As a researcher, the integrity of your research output and practice helps to maintain not only your own reputation, but that of your colleagues, your research field, and your university. Codes of conduct can assist in maintaining research integrity.

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1.2 The international context

Unlike the various treaties, conventions, and agreements governing intellectual property (IP), there are no comparable treaties governing the responsible conduct of research internationally. The key to managing international research projects is trust among the collaborating researchers. When that trust is broken – either from an honest or deliberate mistake – then the integrity of the research is questioned and the relationship between the researchers and institutions is damaged.

In 2010, participants at the 2nd World Conference on Research Integrity developed the *Singapore Statement on Research Integrity*. "The principles and responsibilities set out in the 'Singapore Statement' represent the first international effort to encourage the development of unified policies, guidelines and codes of conduct, with the long-range goal of fostering greater integrity in research worldwide" (http://www.singaporestatement.org/). While the Singapore Statement is not a regulatory document, it is intended to challenge researchers and governments to conduct and manage research responsibly, both locally and on a global basis.

While the Singapore Statement describes the principles and responsibilities of responsible research, in 2009 the Organization for Economic Co-operation and Development (OECD) Global Science Forum released a practical guide for facilitating investigations into research misconduct in international collaborative research projects [OECD, 2009. Facilitating international research misconduct investigations in international collaborative research projects: a practical guide, http://www.oecd.org/dataoecd/42/34/42770261.pdf]. Rather than dictate how research misconduct investigations should be conducted, this OECD guide describes the core principles underpinning any research misconduct investigation, including the inclusion of agreed definitions of research misconduct. Furthermore, the guide recommends that any…

"…agreement for collaborative research involving parties from more than one country should address the promotion of good practice in research and describe the principles, standards and procedures for the investigation of allegations of research misconduct within the project. Agreement on these matters among the parties could be embodied in the formal documents that establish the collaborative research project. Appropriately experienced individuals should be responsible for implementing these requirements" (OECD 2009, p.1).

Questions for reflection

Reflect on the following questions in relation to your research projects:

- Have you discussed responsible research practices and processes for managing disagreements and conflict with your international research collaborators?
- Do agreements covering your international research collaborations include statements on the responsible conduct of research and procedures for investigating allegations of research misconduct should they arise during the project?

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1.3 The *Australian Code for the Responsible Conduct of Research*

The *Australian Code for the Responsible Conduct of Research* (2007; the 'Code') is a joint statement of the ARC, NHMRC, and Universities Australia and has, at its core, the expectations and guidance for maintaining integrity in research, meeting community expectations, and handling allegations of misconduct. The Code provides advice on how to manage research data and materials, how to publish and disseminate research findings, attribution of authorship, obligations in peer review, how to collaborate across institutions, and how to manage conflicts of interest. At many points in this module you will be referred to specific aspects of this Code which support and work in conjunction with your own university's code of conduct for research. This document should be made available in your research group and used as a resource to engage in discussions with your research students and colleagues.

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1.4 Working within university protocols and maintaining good relations with the relevant university agencies

Much of the preceding discussion has looked at research in the traditional way, from the individual dimension. Regarded in this way, the notion of 'compliance' can become one of an imposed requirement and it loses an important aspect, particularly for emerging research leaders. Rather than a 'just-in-time', or post hoc obligation, you may wish to consider the partnership of good research governance and compliance as one in which a researcher can be proactive. Promotion of a robust research environment is about institutional culture and behaviour, as well as the professional performance of individuals. This culture is learnt through experience, mentoring, and formal processes. How many times might you ask a nonacademic member of your staff to meet a compliance obligation? Is it possible that they are more aware than you of the university agencies involved in organisational, governance, and legal issues surrounding your research?

Institutional governance and associated compliance can be core competencies that assist a successful researcher and provide skills which are also transferable outside your university into interactions with government agencies and industry. Are you sufficiently aware of the agencies that operate to support your university's compliance with legal and ethical and good-governance issues? Working from your current awareness of university protocols and your interaction with the agencies involved, how would you consider the following situation?

Activities

1. Safeguarding the Murray–Darling case study, activity 1: ("Who gets hurt?")

What would you do and why?

Professor Prolific has called an urgent meeting of all Murray–Darling Basin (MDB) project leaders. There have been incidents of slippage in research protocols and processes and in many of the compliance requirements. As one of these projects is likely to generate high media interest when raised with the MDB council, representatives of the Murray–Darling Management Trust (MDMT) have been asked to attend. During a break in the discussion an MDMT engineer suggests that surely, so far away from your university, the governance issues you have been concerned with can't possibly apply. Surely it would be better to deal with these issues "on the ground". Research of this complexity in such a greenfield setting must expect some initial problems – the university seems to be "always on your case". He asks, "Why do you bother, who gets hurt?".

What will you reply?

Spend 5–10 minutes considering your response. Bring your notes to the workshop.

2. List of research opportunities

Read the Code if you have not already done so. Consider the list of research opportunities that the MDB community development project has to offer, as shown in the background of the Safeguarding the Murray–Darling case study.

a. Create a list of those for which the Code has implications.

b. Categorise these implications.

Spend 5–10 minutes creating your list and bring your notes to the workshop.

(Note that on the final subtopic page of each topic, the Next > link in the navigation bar below returns you to the first page for this topic, so you can review the topic as a whole and complete any activities listed there before moving on to the next topic via the Organiser page.)

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Topic 2: Grant-holder responsibilities

With the award of research funding comes the expectation that grant holders will comply with research-related institutional policies and that, as a named investigator, you will be responsible for carrying out the project in a timely and financially responsible manner and acknowledge the source of funds when the findings are published. In seeking research funding you will be expected to recognise when conflicts of interest are present and be aware when a conflict of effort could arise to prevent you devoting appropriate time to each project you are pursuing.

Learning outcomes

After completing this module you should be able to:

- Understand the expectations of funding bodies
- Describe the responsibilities of a named investigator
- Identify issues relating to managing research expenditure
- Hold an overall view on conflict of interest.

Topic content

Read the following notes.

2.1 Expectations of funding bodies
2.2 Administering research funds
2.3 Maintaining accountability
2.4 Recognising conflict of interest

At your university

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2.1 Expectations of funding bodies

Funding agencies select, and award funds to, grant-holders and their projects through a competitive peer-reviewed evaluation process. There is an expectation that grant-holders will comply with research-related institutional policies set in place to protect human research participants, animals, and the environment. With specific regard to the work for which the funds have been allocated, funding bodies will expect the grant-holder, most often the first-named investigator, to be responsible for carrying out the project in a timely and financially accountable manner.

Funders provide support for different reasons, which may affect the way in which research findings are disseminated and disclosed. Government funding through the ARC or NHMRC usually places no restrictions on dissemination of findings and carries the expectation that the use of public funds will lead to freely available findings, published or disseminated in a way that increases public good. Private companies often seek to retain the right to the commercial use of the research data flowing from a funding initiative, while philanthropic organisations, depending on their interests, may seek to retain or give away ownership rights. All researchers on funded work, but particularly the first-named chief investigator, should be aware of the obligations to the funder before collecting data. A full discussion of key issues to be aware of concerning IP are covered in *Module 4: Intellectual Property and Commercialisation*.

In accepting funding, you, as a named investigator, should be aware of:

- any caveats on the right to publish and share data
- what your reporting requirements are, including milestone deliverables
- what you can/cannot spend your grant money on.

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2.2 Administering research funds

As a named investigator on a funded project, you should have facilities to:

- Open a research account
- Have a process for managing research expenditure
- Employ appropriate staff
- Invoice external parties.

You can see that these are a shared responsibility with your university. However, as a researcher, you are the one in the position to certify that funds expended for a specific project have been spent on eligible items only. It is worth considering whether your research is sufficiently documented for your university and your co-investigators to be aware that expenditure is consistent with the originally stated aims and objectives of the funded work, will facilitate its timely completion, and are fully expended on the intended work.

Are you aware of any necessary co-funding requirements for receiving and expending funds? (e.g. ARC Linkage projects require that industry funding is appropriately invoiced, received, and documented).

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2.3 Maintaining accountability

There are a number of situations in which you as a grant holder, particularly of a public-funded grant, will be expected to use your own judgement:

- It is generally accepted that you will not seek or receive funds for the same research project from multiple sources, unless this forms part of the award or has been agreed in writing at the award stage.
- A grant holder, typically through their research or grants unit, may modify the aims and objectives of an approved research project in order to follow advancements in your discipline, but you have an obligation not to use any amount of an award for purposes not related to the research project.
- Funding is awarded for a specific research project and nominated personnel. If at any time during the term of funding a named chief investigator ceases to be a member of your university and to contribute to the funded work, your university and the funding sponsor should be notified.
- There is an expectation that personnel be appointed at the correct level and that personnel costs are expected to have first-call on research funds.
- You will be expected to meet any reporting requirements specific to your grant program.
- There is a requirement to acknowledge the funding support wherever possible, in publications and presentations. You should refer to the funding agreement covering your project to ascertain the correct format for acknowledging the funding source.

Activity 2 (Safeguarding the Murray–Darling case study: "Juggling the funds")

What would you do and why?

You have a number of parallel projects and have reasoned that with a mix of public-funded and industry support you can even out some uncertainty you are facing with research funding. You realise that your industry-funded work is subsidising the commercial arm of the company sponsoring your research and that publication numbers are falling. Additionally, you reason that no public-funded research will ever fund truly innovative research, so you will commit funds from both the public and private funds to pilot data for your next large submission to a public-funded research body. Accountability to your industry partner and the public-funding body means that some 'creativity' will be needed in arriving at a balance of funds used for this purpose.

How will you proceed?

Would your position change if rather than a first-named or chief investigator, you were an early career researcher employed on, and benefiting from the momentum of, this work?

Questions for reflection

You might wish to reflect on the following questions for discussion at the module workshop:

- Do you have a strategy for maintaining the momentum in your grant funding?
- Are you aware of resources within your university that can be used to fund strategic pilot work?

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2.4 Recognising conflict of interest

A conflict of interest occurs when the private interests of a researcher interfere, or appear to interfere, with the performance of their official duties. As described in the *Managing conflicts of interest in the public sector: guidelines*(2004) produced by the NSW Independent Commission Against Corruption and the Queensland Crime and Misconduct Commission, conflicts of interest can be actual, perceived, or potential:

- An *actual* conflict of interest involves a direct conflict between a [researcher's] current duties and responsibilities and existing private interests.
- A *perceived* or *apparent* conflict of interest can exist where it could be perceived, or appears, that a [researcher's] private interests could improperly influence the performance of their duties – whether or not this is in fact the case.
- A *potential* conflict of interest arises where a [researcher] has private interests that could conflict with their official duties in the future.

Section 7 of the Code describes that conflicts of interest in the research area are common and should be managed to limit their potential to compromise judgments and decisions that should be made impartially. Such a compromise could undermine community trust in research.

Financial conflicts of interest are typically the foremost in the public mind, but other conflicts of interest also occur in research, including personal, professional, and institutional advantages.

Activity

Identifying a conflict of interest

Think of a research project you are currently undertaking.

In assessing whether you have an actual, reasonably perceived, or potential conflict of interest in relation to this project, ask yourself the following questions:

- Would I or anyone associated with me benefit from or be detrimentally affected by my involvement in this project?
- Do I have a current or previous personal, professional, or financial relationship or association of any significance with the funder of this project?
- Do I or a relative, friend, or associate of theirs stand to gain or lose financially as a result of the research project?
- Have I made any promises or commitments in relation to the research outcomes?
- Have I received a benefit or hospitality from someone who stands to gain or lose from the outcomes of the project?
- Could there be any other benefits or factors that could cast doubts on my objectivity regarding reporting the project's findings?

Activity adapted from Tool 8.1 in the *Managing conflicts of interest in the public sector: toolkit*(2004), the NSW Independent Commission Against Corruption and the Queensland Crime and Misconduct Commission (http://www.cmc.qld.gov.au/topics/misconduct/misconduct-prevention/major-risk-areas/conflicts-of-interest/conflicts-of-interest).

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Topic 3: Research integrity

A research leader is proactive in creating an environment for responsible research practices. Ideally the academic environment will allow broad-ranging discussion with your colleagues around such issues as publication, ethical clearances, research confidentiality, and the responsibility to seek ethical funding. There is an expectation that research leaders should welcome discussions which emphasise professional and personal integrity.

Learning outcomes

After completing this module you should be able to:

- Hold an informed view on research integrity and ethical research
- Describe your responsibilities for publishing and disseminating your research findings
- Define the criteria for authorship
- List the ethics and biosafety clearances required and the committees you engage with in your research
- Define research misconduct and its consequences
- Identify research issues requiring confidentiality
- Recognise the measures for ethical funding of your research.

Topic Content

Read the following notes.
3.1 Research integrity
3.2 Publication and dissemination of research findings
3.3 Authorship
3.4 Ethics and biosafety clearances and committees
3.5 Research misconduct and questionable research practices
3.6 Research confidentiality
3.7 Ethical funding

At your University

Pursuing the topic further

Engaging with this material (and the material in other sections of the module under the same heading) is optional. However, if you wish to gain a deeper understanding of the topic you may find this material useful. There are many books, articles, and commentaries on contemporary research ethics and integrity in the governance of research. In addition to the suggested online reading throughout the module, some books are suggested if you are interested in reading further. These introduce research ethics in the engineering, biomedical, and corporate context. An outline of most books can be viewed online and these books may be available from your university library. Some very contemporary high-profile cases of research misconduct are presented as published articles and editorials. These readings are included as they appeared in either *Nature* or *Science* and can be readily accessed through your university library subscription. Some Australian commentary is also included.

Barnbaum, D. R. and Byron, M. (2001). *Research Ethics: Text and Readings*. Prentice Hall Inc. Outline (http://www.amazon.com/Research-Ethics-Readings-Deborah-Barnbaum/dp/0130212644/ref=sr_1_1/103-9342180-7186251?ie=UTF8&s=books&qid=1193010452&sr=8-1)

Chong, S. and Normile, D. (2006). Stem cells. How young Korean researchers helped unearth a scandal. *Science* 311: 2225.

Dhanda, R. K. (2002). *Guiding Icarus: Merging Bioethics with Corporate Interests*. Wiley-Liss. Outline (http://www.amazon.com/Guiding-Icarus-Bioethics-Corporate-Interests/dp/0471223808/ref=sr_1_1/103-9342180-7186251?ie=UTF8&s=books&qid=1193011167&sr=1-1)

Gerber, P. (2006). What can we learn from the Hwang and Sudbo affairs? *Medical Journal of Australia* 184: 632635. Full Text (http://www.mja.com.au/public/issues/184_12_190606/ger10184_fm.html)

Martinson, B. C., Anderson M. S. and de Vries, R. (2005). Scientists behaving badly. *Nature* 435: 737738.

Maher, B. (2010). Sabotage! *Nature* 467: 516-518.

Miller, G. (2006). A Scientist's Nightmare: Software problems lead to five retractions. *Science* 314: 18561857.

National Academies Press. (2002). *Integrity in Scientific Research: Creating an Environment That Promotes Responsible Conduct*, can be read online (http://books.nap.edu/catalog.php?record_id=10430). Chapters 13 are of particular use when considering this topic.

Steneck, N. H. (2007). *ORI Introduction to the Responsible Conduct of Research*, can be read online (www.ori.hhs.gov/documents/rcrintro.pdf).

Van der Weyden, M. (2006). Preventing and processing research misconduct: a new Australian code for responsible research. *Medical Journal of Australia* 184: 430431. Full text

Whitbeck, C. and Flowers, W. C. (1998). *Ethics in Engineering Practice and Research* (Paperback). Cambridge University Press. Outline

The US Office of Research Integrity has funded various projects to develop education tools for raising issues with researchers. Many of these tools can be used in the Australian context and are available online.

The International Committee of Medical Journal Editors (http://www.icmje.org/) and Committee on Publication Ethics (http://publicationethics.org/) also have a range of resources for researchers interested in publication ethics.

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3.1 Research integrity

"Integrity without knowledge is weak and useless, and knowledge without integrity is dangerous and dreadful" (Samuel Johnston, Rasselas XLI).

Researchers bring personal integrity to their research dealings and create a research culture that reflects both their integrity and their knowledge. Much depends on the connotation you put on personal integrity: whether it needs to be placed in a context of moral principles or whether some of the following descriptors from the Oxford Thesaurus are more comfortable: moral uprightness; honesty; wholeness; soundness; rectitude; uprightness; decency; honour; principle; goodness; virtue, incorruptibility; probity; honesty; veracity, trustworthiness.

Irrespective of how much is written on the concept of personal integrity, it is worth considering how many of those you have admired as mentors and as advisors throughout your research career have displayed the above qualities.

In a definition of integrity in research, the US Institute of Medicine of the National Research Council of the National Academies have proposed

- For a [researcher,] integrity embodies above all the individual's commitment to intellectual honesty and personal responsibility. It is an aspect of moral character and experience.
- For an [institution] it is a commitment to creating an environment that promotes responsible conduct by embracing standards of excellence, trustworthiness and lawfulness.

These definitions appear in *Integrity in Scientific Research: Creating an Environment That Promotes Responsible Conduct*, which can be read onlineif you wish to pursue this further.

In subtopic 1.2, we introduced the Singapore Statement. The Singapore Statement lists four basic principles of research integrity: *honesty* in all aspects of research; *accountability* in the conduct of research; *professional courtesy and fairness* in working with others; and *good stewardship* of research on behalf of others. The Singapore Statement also lists 13 responsibilities of conducting research with integrity covering such areas as research methods and findings, public communication, and reporting irresponsible research practices. The Singapore Statement and be read online (http://www.singaporestatement.org/) if you wish to pursue this further.

The understanding of ethical principles and ideas, and the ability and willingness to apply them, needs continuous renewal and reinforcement and leads to institutional codes of conduct or to codes of conduct for particular professions. The maintenance of individual ethical habits, and of an ethical organisational culture, requires active participation in processes of regular ethical renewal and reinforcement. These can include peer discussions of organisational values and principles, and individual reflection on ethical problems as they arise. One meeting point of personal and professional ethics comes in the consideration of recognising conflicts of interest: in recognising those situations where it may be possible to promote your own interests and lead to a real or perceived compromise to the independent judgement expected of a researcher. Situations that arise could be intrinsic to your research study design or relate to peer review of funding proposals or of work for publication, your interaction with commercial partners, or other entrepreneurial actions. Conflicts of interest can be declared and worked through, leading either to the elimination or effective management of the area of conflict. Should you find yourself with a strongly personal reason contributing to a conflict of interest, the conflict, but not the reason, needs to be declared. In this situation you would be expected to take no further part in the activity.

At your university

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3.2 Publication and dissemination of research findings

Publications credit a researcher's activities, allowing an evaluation of the contribution to your discipline to be made by funding bodies as well as attracting investigators to your work either as peers and colleagues or as potential new recruits. In many respects you have the freedom to publish however and whatever you see fit, but the way this is achieved requires attention to the responsibilities of publication. A review of Section 4, Publication and Dissemination of Research Findings, in the Code will indicate that there are both institutional and individual responsibilities.

Your university should:

- Promote the responsible publication and dissemination of research findings
- Protect confidentiality and manage IP
- Support communication of research findings to the wider public.

As a researcher you should:

- Disseminate all research findings
- Ensure accuracy of results
- Disclose multiple submissions of research findings
- Obtain permission for republishing
- Disclose research support accurately
- Register clinical trials
- Cite publications accurately
- Protect IP and manage confidentiality
- Responsibly communicate research findings to the wider public.

You can see that many of these are a shared responsibility. It is worth considering here whether your research is sufficiently documented for your university and your co-investigators to be aware of any IP outcomes, the sources of research support, and those to whom you owe a responsibility of information.

Are your research meetings around findings and their publication sufficiently open – to all contributors – for all to be aware of the accuracy of the results and that the interpretation is not biased (possibly leading to the omission of contributory information)?

At your university

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3.3 Authorship

Increasingly, research is being conducted in teams, and publications resulting from this research contain many authors. But should all persons involved in the work be included as authors on publications arising from the research? Are there contributions to the research that do or do not warrant authorship?

Section 5 of the Code states that authorship must be based on substantial contributions in a combination of:

- Conception and design of the project
- Analysis and interpretation of the research data
- Drafting significant parts of the work or critically revising it so as to contribute to the interpretation.

Furthermore, the Code specifies that authorship should not be offered to those who do not meet these requirements. For example, none of the following contributions, in isolation, justifies including a person as an author:

- Being head of department or personal friend
- Providing a technical contribution but no other intellectual input to the project or publication
- Providing routine assistance in some aspects of the project, the acquisition of funding, or general supervision of the research team
- Providing data that has already been published or materials obtained from third parties, but with no other intellectual input.

It is also important that authorship is offered to all people who meet the above criteria, and those offered authorship must accept or decline in writing.

Your university should:

- Have a clear authorship policy
- Develop and maintain criteria for authorship
- Prevent and manage authorship disputes.

As a researcher you should:

- Follow policies on authorship including journals' authorship requirements
- Agree on authorship
- Include all authors
- Do not allow unacceptable inclusions of authorship
- Acknowledge other contributions fairly
- Extend authorship policies to web-based publications
- Keep copies of consent and declined offers of authorship.

The International Committee of Medical Journal Editors (ICMJE) provides extensive guidance online (http://www.icmje.org/) for managing authorship.

But what about author order? In some disciplines, the order of authors carries meaning. For example, in the sciences, the first and last author positions are coveted, with the student or postdoc who 'did the work' usually named as first author, while the 'lab group leader' usually named as the last author. Does author order mean something different in your discipline? If you are conducting interdisciplinary research, it is worthwhile finding out the norms of author order assignment in the disciplines of your colleagues.

While the Code and other guidelines such as the Vancouver Protocol developed by the ICMJE describe what contributions warrant authorship, they do not provide guidance on determining author order. Over the years, various models have been established to assist researchers determine author order on their publications. A few examples are:

- Beveridge, C. A. and Morris, S. E. (2007). Order of merit. *Nature* 448: 508, www.authorder.com
- Winston, R. B. (1985). A suggested procedure for determining order of authorship in research publications. *Journal of Counseling and Development* 63: 515-518.

Although provision is usually made for settling authorship disputes, it is worth considering how these may be avoided. It is recommended that collaborating researchers should agree on the process of authorship and author order determinations at an early stage in the research project, and this process should be discussed with additional persons who join the group at a later date. Make sure that you maintain a record of these discussions for later reference.

At your university

Activity 3 (Safeguarding the Murray–Darling case study: "Who is an author?")

What would you do and why?

A senior colleague approaches you for authorship on a paper you have discussed previously in a departmental meeting setting.

This colleague has been of great assistance in the past and is in a position to write an extremely favourable supporting letter for a position you are considering. Additionally, this colleague believes they are losing research momentum and, in the light of the Excellence in Research for Australia (ERA), is feeling, for the first time in a contributory career, at a disadvantage.

Would you include this colleague as an author?

How would you discuss this with your colleague, and your research group?

Take 10 minutes to make a note of your responses and bring them to the workshop where this will be discussed further.

Questions for further reflection

It is worth noting that the Code has provision for authorship for a researcher who has been involved in analysis and interpretation of the research data or in drafting part or all of the article or critically revising it.

Would you raise these aspects with your senior colleague and with your research group to determine a means to include the senior colleague as an author?

Would you consider there was any conflict of interest in doing so?

And if so, how could this conflict of interest be managed?

Activity 4 (Safeguarding the Murray–Darling case study: "Who is an author 2?")

What would you do and why?

A PhD student comes to you to discuss a problem they are facing. They are finalising a paper for publishing and they have been asked by their supervisor (a well-respected and successful researcher) to have their name put on the paper. The supervisor did no direct work on the research for the paper. In talking with the student it becomes obvious that some of the ideas that formed the genesis of the paper came out of discussions they had with the supervisor.

Take 10 minutes to make a note of your responses and bring them to the workshop where this will be discussed further.

Questions for further reflection

It is worth noting that the Code has provision for authorship for a researcher who has been involved in analysis and interpretation of the research data or in drafting part or all of the article or critically revising it.

Would you raise these aspects with your senior colleague and with your research group to determine a means to include the senior colleague as an author?

Would you consider there was any conflict of interest in doing so?

And if so, how could this conflict of interest be managed?

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3.4 Ethics and biosafety clearances and committees

Many of the interactions that a researcher has with research subjects or research materials are carefully regulated by society. Society's involvement has come about primarily because human subjects can and have been harmed by research. Research involving human subjects – whether gathering information, administering tests, or administering agents; collecting tissue, blood, or other body fluids; or using archived material where the subject is identified –requires considerations of recruitment and consent, and all of this stems from a need to demonstrate respect for persons. The ethical principles underlying this are now well described and accepted, but historically they follow in the wake of a record of failure which no researcher of integrity could now support. In the additional reading material you may wish to review the material that led to the establishment of the Nuremberg Code, the Declaration of Helsinki, or the initial and subsequent NHMRC National Statements.

Researchers must also consider regulations regarding the use of animals in research, and the use of chemical and biological agents, both of which can affect the environment of the researcher and the wider community. All institutions which receive funding from the NHMRC or ARC are required to follow the existing codes for the use of human subjects and the use of animals in research; they must also establish appropriately constituted ethics committees which review research before it commences, while it is happening, and at its completion. These codes are:

- The *NHMRC National Statement on Ethical Conduct in Human Research* (2007). In addition, researchers working in health-related research with Aboriginal and Torres Strait Islander peoples may also need to consult *Values and Ethics: Guidelines for Ethical Conduct in Aboriginal and Torres Strait Islander Health Research*.
- *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* (7th edition 2004).

Additionally, researchers may need approval for:

- Importing materials into Australia (Australian Quarantine and Inspection Service, AQIS).
- Using or creating a genetically-modified organism (The Office of the Gene Technology Regulator, OGTR).

You may also be required to comply with your university's requirements when:

- Receiving or sharing products of research (Materials Transfer Agreement).

Robust research practice requires that these considerations be built into your research planning. Research integrity requires that you can identify the risks involved in any planned research and have in place mechanisms to protect research subjects and your research colleagues.

The instances when you will require ethical approval are described briefly below:

- *Research involving human participation.* All research involving human participation – in any of its many forms, including interviews and the completion of questionnaires – requires clearance from your institution's Human Ethics Review Committee. Student projects must also be cleared before commencement.
- *Research involving the use of animals.* All work involving the use of animals must be reviewed by an Animal Ethics Committee and no animal experimentation can take place without a current animal ethics clearance.
- *Biosafety.* Appropriate biosafety approvals must be obtained from your institution's Biosafety Committee prior to commencement of the research project, and the first-named chief investigator must ensure that project staff and students are qualified, trained, and appropriately supervised. There are potential health risks in using chemicals and biohazardous materials in the workplace, and all personnel working with such material should be familiar with and comply with regulatory authorities and internal university requirements in this area.

Time lag between application and approval of clearances. Ethical and biosafety review committees have a high workload and each application needs to be carefully scrutinised. It is no surprise, therefore, that it can take some time to obtain ethics or biosafety approval, delaying the commencement of your project. To avoid delays you should lodge your application for ethics or biosafety clearance at the same time as you submit your grant application. By doing this you will not only be able to make a start on preliminary work, but you will also be able to commence your project as soon as the funding agreement has been signed.

At your University

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3.5 Research misconduct and questionable research practices

Just as research integrity sustains a reputation hierarchy, the other side of the coin is that research misconduct and questionable research practices can bring this into jeopardy. One high profile international example that jeopardised this reputation was the case of Andrew Wakefield and the measles, mumps, and rubella (MMR) vaccine. In 1998, Wakefield et al. published an article that implied a link between the MMR vaccine and a 'new syndrome' of autism and bowel disease [Wakefield, A. J., Murch, S. H., Anthony, A., Linnell, J., Casson, D. M., Malik, M., Berelowitz, M., Dhillon, A. P., Thomson, M. A., Harvey, P., Valentine, A., Davies, S. E. and Walker-Smith, J. A. (1998). Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *The Lancet* 351: 637-641]. In the decade following the paper's release, subsequent studies found no evidence of a link between the MMR vaccine and autism. Following claims that the data reported in the 1998 paper were falsified, several subsequent investigations proved the data to be false. The paper was retracted in 2010. Despite the retraction, the fear of a potential link between the MMR vaccine and autism had rapidly spread around the world, with parents questioning the risks of vaccinating their children against measles, mumps, and rubella.

For more information on the case of the MMR vaccine research fraud, go to:

- Deer, B. (2011). Secrets of the MMR scare: How the case against the MMR vaccine was fixed. *BMJ*, 342:c5347 (http://www.bmj.com/content/342/bmj.c5347.full)
- Deer, B. (2011). Secrets of the MMR scare: How the vaccine crisis was meant to make money. *BMJ*, 342:c5258 (http://www.bmj.com/content/342/bmj.c5258.extract)
- Deer, B. (2011). Secrets of the MMR scare: The *Lancet*'s two days to bury bad news. *BMJ*, 342:c7001 (http://www.bmj.com/content/342/bmj.c7001.full)

3.5.1 Research misconduct

Section 10 of the Code(http://www.nhmrc.gov.au/publications/synopses/r39syn.htm) lists as examples of research misconduct:

- Fabrication of results
- Falsification or misrepresentation of results
- Plagiarism
- Misleading ascription of authorship
- Failure to declare and manage serious conflicts of interest
- Falsification or misrepresentation to obtain funding
- Conducting research without ethics approval as required by the *National Statement on Ethical Conduct in Research involving Humans* and the *Australian Code for the Care and Use of Animals for Scientific Purposes*
- Risking the safety of human participants, or the well-being of animals or the environment
- Deviations from this Code (http://www.nhmrc.gov.au/publications/synopses/r39syn.htm) that occur through gross or persistent negligence
- Willful concealment or falsification of research misconduct by others.

It is important to note that the examples of research misconduct listed in the Code (http://www.nhmrc.gov.au/publications/synopses/r39syn.htm) are not universally accepted as research misconduct. For example, in the US, the ORI defines research misconduct as "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results" (http://ori.hhs.gov/misconduct/definition_misconduct.shtml). As discussed in subtopic 1.2, this example again highlights the importance of including statements on research conduct and misconduct in any international agreements.

National and international research codes of conduct stress that misconduct does not include differences of opinion or honest differences in judgement in management of the research project. Honest errors that are minor or unintentional can occur, but, as breaches of the code, they must be acknowledged and rectified. This is particularly so if erroneous data has been disseminated and contributes to the body of knowledge in a field.

Deviation from the Code(http://www.nhmrc.gov.au/publications/synopses/r39syn.htm) is taken to constitute research misconduct, and this module has considered previously the damage to reputations of individuals and the university, together with the undermining of public trust, which can follow research misconduct. Well-reasoned responses to inevitable ethical dilemmas that arise during the course of research can resolve ethical conflict. Such responses not only label issues but identify the underlying elements so that ethical research can be fostered.

3.5.2 Questionable research practices

Increasingly, the question is being posed whether serious misconduct is the only problem which can damage the integrity of the research process. In an early US National Academy of Science publication, *Responsible Science Ensuring the Integrity of the Research Process,* a distinction was drawn between the three issues of falsification, fabrication, and plagiarism that have underpinned research misconduct definitions and questionable research practices. While these issues and distinctions were initially identified within the context of scientific research, they apply across all research disciplines. Although these practices may not directly damage the integrity of the research process, they can:

- Erode confidence in the integrity of the research process
- Violate traditions associated with research
- Affect research conclusions
- Waste time and resources
- Weaken the education of new researchers.

Questionable research practices which are the forerunners of the misconduct defined by the Code (http://www.nhmrc.gov.au/publications/synopses/r39syn.htm) can be found in the planning, conduct, interpretation, publishing, and review phases of research and can include:

- Bias in selecting methods that favour the desired outcome in results
- Failing to disclose all conflicts of interest
- Supplying overoptimistic interpretations to review committees
- Failing to follow protocols, particularly in human subject research
- Supervising inadequately
- Using inappropriate statistical methods
- Bias in selection of data and controls
- Drawing unjustified or unsupported conclusions
- Giving honorary or ghost authorships
- Withholding crucial information in abstracts or publications
- Giving cursory review to the work of others
- Failing to maintain confidentiality
- Bias towards or against colleagues, fields, or legitimately argued points of view.

Activity 5 (Safeguarding the Murray–Darling case study: "Correcting an error")

What would you do and why?

You may wish to consider the following set of circumstances and consider how you would choose and defend your point of view. The circumstances are based on an actual case [*Nature* 417: p677, 2002] but will be put in the context of the *Safeguarding the Murray–Darling* case study. If you have not already done so, familiarise yourself with it before reading further.

You buy an off-the-shelf statistics package and use it on an unchecked supplier's default setting. The statistics package was used to estimate the health risk posed by particulates in the water in the Basin, which has become a source of fierce environmental controversy. You subsequently read that one research group has recognised the potential for error in using the default setting and have published this as a caution. It is expected that all groups using this methodology throughout the world will revise estimates of the health risk and correct any published work. This is despite the effects it would have in lessening the impact of any emission control research data compiled using the default setting (as in some cases it doubled the estimate of health risk).

1. Do you consider there was any misconduct on the part of your group in using the initial statistical package?

2. What steps will you take to revise your estimates presented recently to the Murray–Darling Management Trust (MDMT)?

Spend no more than 10 minutes on this, make a note of your responses, and bring them to the workshop, where this will be discussed further.

Questions for further reflection

Perhaps you consider that there would be too much fallout in explaining and admitting this error to the MDMT, as you have been working hard to establish a 'good' relationship and they have used this data to push for stronger water control measures.

Is this research misconduct?

MDMT are so disturbed by the uncorrected data that you are invited to a board meeting and asked to work on an enviro-friendly campaign and to monitor the outcome of a major remediation effort. You decide it is time to make the correction to the statistics package but use the correction only on the remediation data as it will make the remediation appear more compelling.

Is this research misconduct?

A new Fellow is recruited to your department. He has used this statistical package in the UK and wrote the retraction/reassessment document of his group's work. He wants to share war-stories and asks how you handled the situation and can he see the data from the pre- and post-remediation studies. You withhold the data.

Is this research misconduct?

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3.6 Research confidentiality

The obligation to preserve confidentiality stems from the principle of autonomy or respect for persons. In a research context this is not only the data obtained on or from individuals but extends to research findings where any confidentiality agreement may apply. As a researcher, you are required to:

- Keep in confidence any data obtained from study subjects where an assurance of confidentiality has been given
- Develop confidentiality agreements in consultation with your university
- Honour the privacy of individuals and the confidentiality of research materials in the manner of storage and maintenance
- Maintain confidentiality in any communications (oral and written) about the research.

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3.7 Ethical funding

Ethical funding requires that sometimes a researcher must weigh the benefits of rewards against conflicting goals and arrive at a decision independent of personal interest. Public-funded research has the expectation of a contribution to society, and privately sponsored and funded research can have the added expectations of sponsor or industry goals. As a researcher you should be aware of the circumstances of funding sufficient to make an informed decision. You should be aware of any funding sources which are judged by society and your university to be inappropriate. Additionally you should be aware of the requirement for complete disbursal of the funds for the work you have been contracted to perform.

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Topic 4: Managing your research records

In today's research context it is most likely that research will be undertaken by groups of researchers, or at the very least in a dual student–supervisor relationship, rather than by an individual researcher. Collaborative research has grown dramatically and this can involve both local and distance relationships. Fundamental to the research relationship within a research group or between collaborators is the expectation that all data will be collected, shared, and retained in a way that will achieve maximum benefit.

Learning outcomes

After completing this module you should be able to:

- Identify the importance of adequate record keeping for your research
- Understand the benefits of, and requirements for, research data sharing and access
- Recognise the expectation of research data ownership
- Identify issues in maintaining research records and in managing electronic data
- Identify important considerations for conducting collaborative research
- Identify resources to help you develop a data management plan.

Topic content

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4.1 Responsible record keeping

Proper record keeping is intrinsic to the research process, and the way in which research records and data are collected and captured will reflect the nature of the research and the preference and experience of the researcher. Adequate record keeping is critical for efficient project management and documenting the integrity of research results, and may actually be a legislative requirement under records and archives Acts.

You will collect both research records and data during the course of your research project. The University of Melbourne *Policy on the Management of Research Data and Records* defines research records as:

"…documents containing data or information of any kind and in any form (including both paper-based and electronic format) created or received by an organisation or person for use in the course of their work and subsequently kept by that organisation or individual as evidence of that work, or because of the informational value of the data that such documents contain. Records associated with the research process include correspondence (including electronic mail as well as paper-based correspondence); project files; grant applications; ethics applications; technical reports; research reports; master lists; signed consent forms; and information sheets for research participants."

How do you currently manage your research records? From time to time, funding bodies may audit some projects they fund at your university. Your own university or their ethics committee may also conduct project audits. If your project was audited, would you be in a position to reproduce the necessary research records that may be requested in a timely manner?

Record keeping in the active stages of your research also has legal implications and requirements. Record keeping is critical in IP considerations. Protection of IP may require the disclosure of your records and responsibly kept records continue to be important after issue of any patent. In a legal challenge, patents can be sustained or nullified after inspection of original research records.

In addition to research records, you also produce research data during the course of a project. Unless you are involved in a research process with an initially determined set of rigorous protocols for collection of the research data, how you choose to collect and protect data in the active stage of your research should be a mark of your respect for the research process and participants, and a recognition by you that this record may become a key resource for the ongoing work of your research group.

You have already familiarised yourself with the Code and will be aware that there are both institutional and individual researcher requirements for the management of research data and primary materials. Management includes the collection, retention, storage, and ultimate disposal of research data and primary materials after the specified retention period.

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4.2 Research data access and sharing

Making research data available to others has many benefits for researchers. Some of the benefits include:

- greater exposure of research which may be useful for obtaining grants or getting published
- increasing citations of your published work
- greater opportunities for research collaboration across disciplines and with international researchers.

The authors of one study have established that publicly available data was significantly associated with a 69% increase in citations, independently of journal impact factor, date of publication, and author's country of origin (Piwowar, H.A., Day, R.S. and Fridsma, D.B. (2007). Sharing detailed research data is associated with increased citation rate. *PLoS ONE* 2(3): e308. doi:10.1371/journal.pone.0000308).

In addition to the personal benefits that data sharing may bring, researchers and institutions are also required to make data available to others. From a funding body perspective, Section 2, clause 2.5.2 of the Code states "research data should be made available for use by other researchers unless this is prevented by ethical, privacy, or confidentiality matters". Furthermore, funding agreements from the ARC require researchers, where possible, to make data publicly available within a specified time frame, generally through deposit in an institutional or discipline-specific public repository. Some journals also require researchers to make the data used in the publication available to interested persons, for example, the Nature Publishing Group requires authors to "make materials, data and associated protocols promptly available to readers" (http://www.nature.com/authors/policies/availability.html).

Before sharing data during a project or after it is finished, you need to make sure that you have considered the implications of doing so, in terms of data and IP ownership, and ethical requirements like privacy and confidentiality.

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4.3 Research data ownership

Ownership may be influenced by the funding or contractual arrangements of specific research projects. As part of your overall project management, you must ensure that ownership of research data is identified and documented at the start of a research project and reviewed and updated whenever appropriate. This is particularly important for cross-institutional research projects. You should work with your research legal or contracts area to understand the arrangements in place regarding ownership of data you generate during the course of a research project.

Staff and students may have different ownership rights regarding data produced in the course of research. You should refer to your relevant university policy on data ownership for more information. Australian copyright law may also govern certain types of data you generate, so seek advice from your research legal or contracts area for a greater understanding of this in relation to your work.

Aside from who actually 'owns' the data, researchers commonly enquire who has the right to use the data generated in the course of the research. Are you able to take the data you generated with you if you leave the university? Are research students able to take the data they generated during the course of their study with them when they finish their studies? To help you answer these questions, you should refer to your relevant university policy on data ownership for more information.

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4.4 Retaining research data

Research data must be retained according to the periods specified in the Code and archives and records legislation, and you should note the retention period required for your research data during the planning phase of your project. In general, the minimum retention period for research data is 5 years post-publication; however, the actual period may vary depending upon the local jurisdiction, the discipline and type of research, other institutional policies, and the requirements of bodies such as funding agencies and commercial sponsors. For example:

- For most clinical trials, retaining the research data for 15 years or more may be necessary;
- For areas such as gene therapy, research data must be retained permanently (e.g. patient records);
- If the work has community or heritage value, research data should be kept permanently, preferably within a national collection;
- If results from research are challenged, all relevant data and materials must be retained until the matter is resolved;
- Research records that may be relevant to allegations of research misconduct must be kept according to the terms of the resolution of the matter.

How long do you usually retain data for after a project has ended? Do you know if this period is consistent with legislative and funding-body requirements for data retention?

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4.5 Electronic data

You are required to store all data in a secure manner. Electronic data has particular requirements to ensure privacy is maintained. As part of your research protocols you may have made the undertaking to an ethics committee that data would be password protected, and often this may due to the sensitivity of some data which may need to be stored in an encrypted form.

In addition to privacy and security, you also need to consider using a durable format for storing your research data. Durable formats are those that will be usable for at least the lifetime of the project and the duration of any legislative and/or funding agency retention period.

For digital research data, you should adopt file formats that meet criteria such as:

- endorsed and published by standards agencies such as Standards Australia and ISO
- publicly documented, i.e. complete authoritative specifications are available
- self-documenting, i.e. the digital file itself can include useful metadata
- widely used and accepted as best practice within the researcher's discipline or another user community.

You should also consider the long-term availability of and support for any hardware and software used to create and manipulate research data. Considerations include:

- the likely time that the hardware and software will be available
- the size and level of activity of the developer and user communities
- the level of technical support that is available now and in the future.

Where there is a reliance on specific software, you should consider storing the programs and any related documentation with the research data, if the terms and conditions under which you bought or licensed the software permit you to do this.

Are you in a position to adequately maintain your research data and have you sufficiently briefed your information technology personnel of your requirements?

Activity 6 (Safeguarding the Murray–Darling case study: "Who gets the data?")

Consider this situation that has arisen in the Murray–Darling project:

One of your co-project leaders indicates he has the opportunity to move to the US and will be leaving the project. You know from your research meetings that if he left the project now you do not have much of the data readily to hand and the impact of your joint findings would be considerably reduced. You ask that he begin to duplicate the data and you will create an index for easy joint retrieval. He runs out of time and proposes to take the data, which is in both hard copy and electronic form, with him. He will take out insurance on the consignment and be in a position to sort and select the data that you will need for joint publications.

What is your response?

Activity 7 (Safeguarding the Murray–Darling case study: "The data has flown")

The MDB project plans a retreat where major findings will be discussed and future research directions planned. As you will have some free time at the retreat, you load a selection of images from a photographic archive that the Basin's Indigenous elders regard as particularly sensitive and have given to you as confidential information, together with your presentation. You will have a chance to analyse the images in preparation for putting some questions to the elders on the cultural aspects depicted and why these are so sensitive. At the meeting a MDMT director leans over to ask if she can take a copy of your presentation. You hand over your memory stick and realise she is downloading the two files you brought with you. She races from the meeting to catch her flight.

What are your next actions?

Take 10 minutes to make notes of your responses to these two scenarios and bring them to the workshop for further discussion.

Questions for further reflection

You contact the MDMT director and ask her to delete the file containing photographs. You are aware of the fallout if your breach of confidentiality became too widely known, so you do not explain the nature of the files. The director forgets to delete the file and it is seen by her PA who forwards it to the publicity department. Six months later one of the photographs appears on the cover of the MDMT Annual Report.

The Indigenous elder is distressed that he has failed as a custodian of his cultural heritage.

Have you a case of research misconduct to answer?

What might you do immediately to reduce any data loss? If the project leaders allowed loss of data such as this to persist over the life of the research project, would this constitute research misconduct?

What might you implement for project-related data management to avoid any loss of data and research knowledge in the future?

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4.6 Collaborative research

Collaborative research is widespread and can be as simple as sharing a resource with a colleague in the next office, or have the complexities of a major project with national and international participants. You should be aware of all the resources in your university for implementing policies and agreements for joint research collaborations. As a researcher, there are a number of times when you and your research colleagues will be setting the pace. You will sketch out ideas that rapidly settle into place, maybe without the necessary considerations of the consequences. The US ORI Introduction to the Responsible Conduct of Research has a useful list of questions that should be asked in any collaborative arrangements. There are also various sources of information such as 'Section 8 Collaborative Research Across Institutions' of the Code, that will help you arrive at appropriate answers. The questions you should ask should lead to a common understanding of:

- The goals of the project and anticipated outcomes
- The role each partner in the collaboration will play
- How data will be collected and stored
- How changes in the research design will be made
- The criteria that will be used to identify and rank contributing authors
- Who will be responsible for submitting reports and meeting other requirements
- Who will have the responsibility, or authority, to speak publicly for the collaboration
- How IP rights and ownership issues will be resolved
- How the collaboration can be changed and when it will come to an end.

Successful collaborations are based on mutual trust, and by maintaining a continuous collegial conversation about all aspects of the collaboration you can maintain this trust. Furthermore, collaborative agreements provide an opportunity to demonstrate research leadership and share in the benefits.

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4.7 Data management planning

In this topic, we have been discussing the requirements for good research data management. It may at first seem daunting to have to consider all these requirements in addition to doing actual research. However, many institutions now have, or are in the process of developing, their own data management plans for use by their researchers.

By undertaking a data management plan at the commencement of a project, you can ensure that all aspects of data management are holistically explored early in a project. Short- and long-term aims can be balanced, so that decisions made early in a project do not negatively impact on the ability to find and use the research data in the future.

A data management planning process is particularly important in the context of collaborative research projects. By undertaking the planning, you may identify areas of potential difficulty or conflict, and these can be resolved with your collaborators before they escalate into issues. By clarifying ownership of data and ensuring early agreement on technical standards across institutions, you are well on your way to establishing trust and ensuring that your project runs smoothly.

It is common for international funding agencies to require a formal data management plan as part of the funding application process. While this is not yet common practice in Australia, in the near future it is likely that the ARC and the NHMRC will require greater evidence of data management planning at the time of application.

There are several online resources to help you develop your own data management plan, for example:

- Data Management Manual, ANU
- Research Data Planning Checklist, Monash
- The Australian National Data Service (ANDS) provides a number of useful guides on research and research data management

Your data management plan is a valuable resource. You should retain a copy of the data management plan for your own records, and use it as a discussion document when talking to collaborators, services providers, and research administrators.

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Topic 5: Other governance and compliance issues

Meeting governance requirements is essential for maintaining an ethical and robust research community. Compliance is what we do to ensure that we meet the requirements of the law relating to our activities. There is an expectation that, to ensure compliance, you will work together with your university to fulfill an obligation to staff, students, and to the wider community. Failure to comply with the law can have serious consequences for people, the environment, and your university, either through injury, physical or financial damage, or though damage to reputation. In essence, compliance is a way of working fairly, safely, and responsibly and should be integrated into all aspects of research.

Learning outcomes for the module

After completing this module you should be able to:

- Hold an informed view on governance and compliance issues in your research.

Topic Content

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Topic 5.1 Regulatory approvals

Throughout this module there has been an emphasis on the ethical reasons for responsible research within the research community. However, in many cases the obligations have legal consequences for the individual researcher and for the university. In addition to ethics approvals, the avoidance of which constitutes research misconduct, approvals are needed for:

- Importation of biological material
- Creating a genetically-modified organism
- Research that involves ionising and non-ionising radiation, such as radioisotopes, X-rays, UV light, and lasers.

The responsibility for initial compliance with importation of biological materials and the requirements of the AQIS biosecurity rests with the researcher. Your university research office should be able to advise you of the requirements for making such an application, or direct you to the part of your university that manages AQIS permits.

The creation of new and use of existing genetically-modified organisms requires approval from the OGTR. Before conducting any research with genetically-modified organisms, you should consult your university research office or similar to enquire about the types of approvals you may need to obtain.

The use of ionising and non-ionising radiation usually entails a university-wide license held by the university from the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), with the researcher being aware of and declaring whenever radiation will be employed.

Institutions, and maybe even individuals, can be fined if appropriate approvals are not sought prior to conducting research in these areas. In addition to financial penalties, reputational damage is another consequence of failing to have the necessary regulatory approvals in place. Perhaps of equal importance, disregard may risk the safety of human participants and the well-being of animals or the environment – another example of research misconduct.

What approvals do you or your research students need to conduct research?

At your University

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Topic 5.2 Higher-degree supervision

As a researcher you have an individual responsibility, but as a supervisor of research students, you have the additional responsibility of actively ensuring that higher-degree research students are aware of the codes of conduct that apply (and are aware of all the other information and advice available to support their compliance). You should discuss with your students whether there are any licences, permits, or permissions required prior to commencing the research. They should be aware of whether their work requires:

- Human ethics approval
- Animal ethics approval
- Gene technology approval
- Biosafety approval
- Import approval for material
- Licences to access certain areas
- Licences to use certain materials
- Permissions from government agencies or communities.

Their research may also involve:

- Native flora and fauna
- Historical or cultural artifacts
- Travel permits
- Access to premises or regions
- Scheduled poisons
- Scheduled carcinogens
- Radiation sources.

In addition to the compliance aspects involved, as a supervisor you assume the frontline duty-of-care for research students.

Does your university have any policies or procedures in place that outline the responsibilities of higher-degree supervisors?

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Topic 5.3 Hands-on or hands-off? What will work for you?

There is an obvious duty-of-care towards research students expected of the university and/or research supervisors. Less obvious is a more general duty-of-care. An emerging research leader has to provide an atmosphere where governance and compliance are respected. You can choose a *hands-on* approach – where you endeavour to have in place records of formal meetings and discussions, and work as a research group to ensure you comply with university policies and procedures. Alternatively, you may choose to make material available and relay an expectation that all are expected to comply. Choosing such a *hands-off* approach carries with it a responsibility not to distance yourself from the working of your close associates. The communal aspect of much research helps to ensure its integrity and should provide a comfortable environment to discuss both research and ethical dilemmas.

Activity 8 (Safeguarding the Murray–Darling case study: "The engineering 'star'")

What would you do and why?

Imagine this situation that has arisen in the MDB project:

One of your students holds an Australian Postgraduate Award Industry (APAI) on an ARC Linkage Project you hold with the Murray–Darling Management Trust (MDMT). She is destined to be an engineering star and has made some breakthroughs in groundwater flow that now, in the third year of the award, are truly exciting and essentially driven by her as a major investigation. She calls you from the Basin region, excited that MDMT have offered to fly her overseas where she will take some measurements and provide an assessment for company hydrologists. "It's not like there's a conflict of interest", she says. "It's all MDMT and this will be my first consultancy as they are going to pay me consultant rates". Being her supervisor, you are aware that there is a Department of Foreign Affairs and Trade (DFAT) travel notification for the area she is travelling to, and rather than discuss the conflict of interest aspect you take the approach that travel is advised against. "You're not my keeper", she says. "I think you just don't want to see me get ahead. I'm going no matter what you say, and besides I will have company security guards with me". She hangs up and you find out that a company plane left an hour later.

She returns safe and happy and on the way through drops into the lab. She apologises for her outburst and is so enthusiastic about "international consultancy" that her trip dominates the conversation over coffee with other research team members. "Guess what", you hear her say, "I'm an international go-between. One of the local hospitals had samples to send to a project in our university and when they heard I was leaving they packed them in dry ice and I brought them back. When we arrived back Customs was a breeze; I was introduced as the newest engineer and was through in no time. I didn't need to declare the samples or anything. I've just dropped them off to the address on the label and they were really surprised. I'm off to sleep".

You are getting ready for a very long discussion about responsible research. Before you can meet, another of your research students asks to talk to you on an important issue. This student says that what was talked about at coffee must be research misconduct. This student adds that you always seem to favour the stars in the lab and they want to take this further, not sweep it under the carpet. What will you do?

Take a few minutes to make a note of your ideas and bring them to the workshop for further discussion.

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Frequently asked questions

1. Where can I find the *Australian Code for the Responsible Conduct of Research*?

You can follow this link to the *Australian Code for the Responsible Conduct of Research* (http://www.nhmrc.gov.au/publications/synopses/r39syn.htm). This is a joint statement of the ARC, NHMRC, and Universities Australia and has at its core the expectations and guidance for maintaining integrity in research, meeting community expectations, and handling allegations of misconduct.

2. Is there an easy definition of research misconduct?

Internationally, it is now accepted that research misconduct includes fabrication, falsification, and plagiarism. However, it is also now well accepted that research misconduct is not as clear-cut and can involve other research practices which are unacceptable, and if a researcher undertakes these with deliberate intent they constitute research misconduct. The *Australian Code for the Responsible Conduct of Research* provides the following examples of research misconduct: fabrication of results; falsification or misrepresentation of results; plagiarism; misleading ascription of authorship; failure to declare and manage serious conflicts of interest; falsification or misrepresentation to obtain funding; conducting research without ethics approval as required by the *National Statement on Ethical Conduct in Research involving Humans* and the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes*; risking the safety of human participants, or the wellbeing of animals or the environment; deviations from the Code that occur through gross or persistent negligence; willful concealment or facilitation of research misconduct by others. The Code also states that research misconduct is not limited to these 10 actions.

3 Where can I read about high-profile cases of research misconduct?

A summary of some high-profile cases of research misconduct and the personal and institutional reputational consequences can be found in:
[News Misconduct Special] Where are they now? Nature 2007, 445: 244–245.

A list of all recently closed inquiries and investigations reported by the US Office of Research Integrity can be found at: http://69.59.142.46/misconduct/cases/

4. What is ARIC?

ARIC is the Australian Research Integrity Committee. It was formed in 2010 and opened for business in February 2011. ARIC was jointly established by the ARC and NHMRC, and provides a review system of institutional processes to respond to allegations of research misconduct. For further information on the ARIC framework, go to http://www.arc.gov.au/general/research_integrity.htm .