Chapter 2
The Life Cycle of a Project

Once one has a clear vision for a research topic, the next step is to develop a project, planning the outlines of the work that will be needed to reach the desired goals and outcomes. Another class of research-related project for which planning is critical is in the development of research infrastructure, such as the commissioning of major equipment.

Normally it will be necessary to seek funding to support the project, and this is done through the submission of a formal research proposal. The requirements for such proposals depend, to some extent, on the individual funding agencies. Nevertheless we can recognise some broad principles that help to provide a good representation of the research concept. Even where a full formal proposal is not required, it is useful to build an informal proposal to capture the features of a project in a succinct form.

Once funding has been secured, detailed planning for the project needs to start in earnest, taking into account the resources available over the time frame of funding. If, for example, new staff have to be recruited, it helps to have made the necessary preparations so that the human resources processes can be set in train as soon as funding is available.

There are well-developed tools to aid project management, and these can be beneficial in a research context. It takes some effort to learn how to use the tools and to set them up, but the return is a much clearer understanding of dependencies, and the critical points of interaction between the different components of a project.

As a research project progresses there are likely to be requirements for reporting on progress through, for example, achievement of milestones and the use of key performance indicators. Although such performance measures are most common for large research programs, the requirements can be imposed on constituent projects. When first encountered such performance measures tend to be regarded as a burdensome nuisance, but can ultimately be a significant help even for a single project.

A simple aspect of project management is tracking the financial situation against the available budget; this is important, but represents only part of what can be achieved. Experience with analysing a project and its development can be of major value when one comes to consider the next research topic.

2.1 Developing a new project

What then needs to be done to develop a new project? We can recognise a number of steps and stages of planning. Initially the process tends to be rather informal, but once funding needs to be sought then more explicit materials are required:

- What is the aim?
  At the beginning it is important to get a clear enunciation of the research target. This will form the base on which you will build the rest of the project plan.
- What are the expectations?
  With a clear target in mind, you can turn to defining appropriate research outcomes associated with the achievement of the target. This will often stimulate thoughts about related outputs, such as publications.
- Is the specification correct?
  The initial thinking should now be sufficient to provide a mental picture of the nature of the research project. It is useful at this point to review the scope of the project:
  ◇ Is the topic well defined and self-contained or is it open-ended?
  ◇ Can you refine your target to produce a clearer vision?
    If the project is relatively open-ended, it may be possible to define a stage marker, for example, a result that is required before any further steps can be taken, and then plan towards that sub-goal. Often only a small change in the definition of target will produce a simplification of the approach, and a consequent gain in terms of ability to achieve the goals. It helps to be flexible in thinking at this early stage, so that you avoid being locked into an ultimately untenable position.
- Establish position in research landscape
  Before you progress too far it is useful to understand where your proposed project sits in the general research landscape:
  ◇ Are you seeking to establish a new direction?
  ◇ Does the project require resources or results from other sources?
    The response to these types of questions will dictate what sort of background material is needed on recent work pertinent to the field. The relevant work may already be well known to you, but it does not hurt to check.
- Earliest version of project plan
  With a general view of the research topic in mind, this is the time to sketch out the nature of the research activity. At this stage the 'plan' may be just a set of notes to summarise the general situation, addressing the main points:
  ◇ What do I need to know to achieve the research goals?

  ⋄ What resources are needed?

  ⋄ What are the appropriate funding sources?

  ⋄ An idea of constraints and bottlenecks.

- Create a potential time line
  This is a good point to try to sketch out the main stages of the research
  and the way that they interact. You need to take into account the
  availability of personnel, and any delays likely if recruitment is required.
  Also, equipment procurement will have a significant lead time that can
  impinge on the development of a project. If multiple strands of work are
  envisaged, this is the point to think about their interaction, so you have
  an idea about dependencies, for example, where one strand builds on the
  results of a second, which must therefore be finished first.

- Draft of project plan
  Once you have a good idea of the full scope of the project and the
  timescale, one should aim to flesh out the project plan to include a clear
  statement of the science goals, and the way in which the work is expected
  to be accomplished.

    With the full range of information that you have now assembled,
  this is a suitable point to use project tools to organise information and
  thereby understand the critical steps. This process will also help you to
  understand the risks associated with the project, from the scientific (is the
  work feasible?) through issues such as ethical clearance for work with
  animals or humans.

- Project plan
  The preliminary work should now have enabled you to get a clear
  concept of the whole project, the way in which it should be tackled and
  any critical hurdles.

    This information can then be used to frame a full project plan including
  an outline budget for the work, in preparation for the writing of a
  proposal. You need to think about what provision has been make for
  contingencies if things go wrong, a particular concern in commissioning
  new equipment.

    The project plan sits alongside the research proposal as a guide to
  the whole range of the work and its interdependencies. It can usefully
  include indicators of progress, such as defined *milestones*.

- Proposal development and submission to funding agency
  The particular form required for a research proposal depends on the
  funding agency and funding scheme. In some cases the scientific and
  budgetary information are separate, more commonly they appear in a
  single document.

    The thinking that has gone into creating the project plan helps to make

the research case more convincing. You still have to 'sell' the importance and need for the scientific component in order to secure the funding.

The proposal has to conform to the rules of the funding agency, and this will place restrictions on the nature of acceptable budget items and allowable time frames. It may be necessary to put forward only part of a broad research program to stay within the bounds of what might be supported. In this case, prior planning should make the order of program components clear.

It is also important to keep track of the funding policy of the agencies to which submission is being made. Where funded amounts are regularly much less than requests, extra effort or proposals may be needed for a project to proceed in full.

- Project funded

  In these days of high competition for research funding, it is likely that multiple proposal submissions are needed to secure funding. Where feedback is supplied it is critical that this be incorporated into the proposal, and the implications for the overall project plan understood.

  When funding is secured, the requirements are to bring the project into action to achieve the research goals. The nature of what can be achieved will be dictated by the level of funding, and the research plan must be revisited for implementation.

- Working project plan

  Now the project is about to start, the project plan needs to be revisited in the light of the prevailing circumstances, particularly the available level of funding. It may be necessary to reduce the scope of the work from what was desired, to accommodate a shorter time period, or less money. Advance planning makes such decisions easier, if not more palatable.

  It is useful to retain the original project plan for reference, but now the time line and resources need to be reworked to form the basis for the way ahead.

  Over the course of a project, external and internal circumstances can change, and so the plan may well need to be updated during the course of the work. Effective research management needs to recognise how the project is developing, and remain flexible to secure the best outcomes.

- Reporting, publications and presentations

  Keep note of any reporting requirements and build these into the working time line. Early in the project it is worth sketching out the expected presentations at conferences etc., and which members of the research group will be responsible. Presentation material can frequently form a good base for the preparation of publications.

  The final report on a funded project generally requires a summary of what has been achieved. It is worthwhile to look back on the project plan

Figure 2.1: Schematic representation of the development of a research project.

at this stage and reflect on how far the forward planning matched with actual progress. This step will aid the development of the next project.

- Lessons
  Often you will find that the research has developed different aspects than expected at the beginning, and rather than answering the questions posed, you have opened up a new group of issues. This is part of the excitement of research; the outcomes can be unexpected. It is important to not force rigid adherence to a plan, except where funding is tied to specific outcomes, but to adapt to circumstances.

  The experience from one project then feeds into the creation of the next,

and what has been learnt from tracking the progress of a project will help improve the next plan.

We can summarise the stages of the research project between concept and completion in the form of a flow chart, as shown in Figure 2.1.

Exercise 2-1:
Prepare an outline project plan for your current project that summarises goals and expectations together with the time frame for the major elements.

2.2 Building a research proposal

The effort put into building a project plan can be readily repaid by the way in which it eases the preparation of research proposals. In particular, a clear concept of the resources required, and the way that they will be employed, can improve the focus of the description of the science to be undertaken.

2.2.1 Formal and informal research proposals

Most research proposals are developed as a means of submission to funding agencies to secure the resources needed to implement the research. In consequence the particular format and classes of information to be required are dictated by the scheme from which funding is sought. Even within the framework of a single funding agency, requirements can differ markedly between programs, for example, with respect to presentation and budget constraints. It is therefore important to make sure that these requirements are understood and implemented in the proposal.

For moderate-size projects the normal mode of operation is to submit a single proposal, though sometimes separate documents are required for the science and budget components. Funding for larger programs will often involve a two-stage process. Initially an *expression of interest* or a relatively short proposal is required. Then selected submissions are invited to prepare a full submission of greater length. The time frames in which the full material is to be prepared can be short, and so it may be necessary to produce a first draft of the full material in case it is needed.

In some circumstances, for example, applications to some of the schemes of the European Research Council, both parts of the proposal have to be submitted with the original application. The first part is used by an assessment panel to judge whether the whole proposal is sent for review. Both parts of the proposal are seen by the external reviewers and by the panel in their final deliberations in the light of the reviews.

Even where no formal research proposal is required, it can be of value to

create a short informal proposal with the aim of summarising the aims of the project and the way in which it will be tackled. This informal proposal material will be found to be valuable as a summary of initial thinking, and as a means of developing a project plan with appropriate organisation of activity. Even if external funding does not have to be sought, there will be a need to achieve the project goals. Such material provides a succinct representation of the project, which is valuable when planning future directions

2.2.2 General considerations

The aim of a research proposal is to provide a convincing case for carrying out a specific research project based on the scientific case and research capacity. The specific work component therefore has to address the following topics:

- What needs to be done?
- Why should it be done?
- Why is it important?
- What can you build on?
- How will you address the issues?
- How will you know you are right?
- What resources are needed?

The way in which these elements are represented in the research proposal will depend on the requirements of the funding scheme. Often length restrictions are imposed on the various sections of the proposal and so brief, but clear, exposition is at a premium.

In addition, information will be sought on the scientific record of the potential participants, including such items as employment history and publications. In some cases the applicant makes a separate statement about the way in which their research experience benefits the project; in others this will form part of the scientific component.

Alongside the scientific and personal elements, the proposed budget will have to be presented, with justification for the various elements. This budget needs to include both the components requested from the funding agency, and funding available from other sources. Normally the budget information is available to reviewers, but in some cases may be in a separate document that is considered only when the science review has been completed.

Increasingly, proponents are expected to point to the way in which the work proposed can provide broader societal and economic impacts. In

some cases the formulation may be as simple as 'contribution to national wealth', but often the prescription is more vague, such as: 'describe how the Proposal might result in national economic, environment and/or social benefits'. Broader impacts are commonly used in proposal assessments, and so should not be neglected.

Before a proposal can be submitted there will normally be a need to obtain appropriate certification from your institution, or that through which the proposal is being submitted. The institutional deadline will normally be somewhat earlier than that imposed by the funding agency, so that the effective timescales for preparation are slightly compressed.

2.2.3 Understand your funding sources and rules

Even when submitting to a single funding agency, different schemes are likely to have differences in eligibility criteria and the specific information that is requested. It is therefore important to read the detailed instructions for the particular scheme and to follow them carefully. There may well have been changes since the last time an application has been made to a particular scheme. In particular, the details of the class of personal information can change.

Where a funding source offers multiple schemes for funding you should make sure that you are choosing the one that is most suitable for the nature of the proposed work. There tend to be more options for strategic and applied research than for basic research, since schemes may exist for collaboration with industrial or government partners. Large research initiatives may offer opportunities in a different form than the standard individual grant, but may also require closer cross-linking with other activities.

When preparing a proposal you should be aware of the *selection criteria* that will be applied to the scheme. This should guide the proportion of effort that you place on different aspects of the proposal. Generally the proposed science plays an important part in assessment, but a strong weight may also be placed on track record in the light of career circumstances.

It is also important to be aware of the detailed funding rules attached to the scheme to which you are applying: there are often restrictions on what are eligible expenses, and there may be specific limits applied, for example, to travel items.

You should also make yourself aware of the way in which the funding agency assesses proposals and makes decisions about funding. A common mode of operation is that proposals are sent for external review, and the

results of the review processes are then moderated by a panel. The panel may then be involved in the funding and budget decisions, but in some cases these are made separately based on a ranking list prepared by a panel.

2.2.4 Proposals as 'sales pitch'

The proposal is the only way in which your vision and research capacity are conveyed to the review process for funding. Ultimately you are trying to sell your ideas against a background of many competing proposals. Your proposal should be as appealing as possible without resorting to overstatement or exaggerated claims. Both scientific and public benefit need to presented to best advantage.

The first thing that anyone will see is the title of the proposal, and so it has considerable importance. You should aim to make the title as clear and interesting as possible within the length constraints.

Commonly an abstract is expected for the proposal, but the required length varies considerably between different agencies. In some cases the abstract is rather short, for example, 100 words and then every word counts. The active voice should be used, not only is this shorter but it is also more direct. The major goals need to be expressed in a pithy way, so that the importance of the work is conveyed. Where a longer abstract is allowed, it is still important to present ideas as succinctly and effectively as possible with a clear emphasis on the project goals. The longer space then allows a more extensive exposition of the major steps in the project that will allow the achievement of the target.

In the main proposal one strives to make the material interesting and accessible, so clarity of expression remains very important. The structure of the material may well be dictated by the funding agency. In this case you will need to make sure that you follow the designated headings to provide suitable background to the work and to demonstrate its significance. Where the format is less prescribed it is still important to give an effective introduction with due acknowledgement of prior work, and then develop the nature of the proposed work and the way in which it will lead to the desired scientific targets.

Many funding agencies place a strong emphasis on 'testing hypotheses' as the primary role of research, and so thought needs to be given to casting the material into an appropriate form to sit within this framework.

The proposal needs to provide a clear message as to the scientific goals and the expected *outcomes*. Although many scientists can formulate clear goals, they are often less good at expressing the likely tangible results of a project. Prior project planning can help in identifying the returns from the

proposed work. Do not confuse *outcomes* with *outputs*, such as publications or web materials associated with the project.

Multi-stage processes

Where the proposal process involves two distinct stages, such as an expression of interest or preliminary proposal followed by a detailed proposal, it is likely that there will be considerable differences in the nature of the material provided in the two stages. Indeed the two sets of material may be assessed in very different ways.

In order to produce a suitably crisp, short proposal for the first stage, it may be necessary to have developed a much fuller set of material. When the specifications for the second stage are already available, it is desirable to follow this as far as possible in the initial development. Some duplication in the nature of the submissions may be inevitable because of the requirements of the two stages. Nevertheless it is good practice to provide some variation in wording, against the event that both components are seen simultaneously by the same reviewer.

2.2.5 Budget preparation

The presentation of a budget is a critical part of a research proposal. The mode of presentation of the budget, particularly with respect to the level of detail, will depend on the funding agencies. Further there can be notable differences between eligibility of different classes of expenditure between different schemes from the same agency. In consequence, it is important to read and understand the funding rules attached to the specific scheme for which an application is being made. Care should be taken in providing adequate explanation for budget items within the space allotted, so that the reasons for the expenditure are well justified.

In many cases the major item of expenditure is likely to be on personnel, where costs will be linked to either to the rates of pay at the host institution or to fixed rates promulgated by the funding agency. In some cases all budgets have to be prepared at current-year prices; in others some allowance for salary increments can be included, but will need to be justified in the explanation of proposed expenditure. The arrangements pertaining to allowable travel expenditure are often quite complex, and the costs for this class of item need to be carefully assessed against the funding rules.

The treatment of infrastructure support by different funding agencies is highly variable. In some systems only direct capital expenditure on equipment is allowed; in others commissioning costs may be included. Frequently operational costs are not available in the infrastructure proposal,

and so a plan has to be developed in advance as to how the infrastructure will be sustained if the proposal is successful.

Sometimes the budget element of the proposal is separate from the scientific component, so that it is not seen by reviewers of the main proposal. In this case the primary assessment will be based on the research proposed, and then budgetary decisions will be formulated separately.

Some funding agencies work on the binary principle of full or no funding; others routinely trim the allocations to successful projects. You need to understand the scenario, and the expectations and practices of the particular funding agency to which the proposal is submitted.

It is not uncommon for some funding schemes to provide less funding than requested. Nevertheless, the budget for a project should never be inflated relative to the work proposed. When the funds granted are less than the request, it will be necessary to re-prioritise the work and maybe drop some components. Such changes may require the approval of the funding agency. For agencies that regularly grant significantly less than requested, the proposal may need to build from the outset some components of the scientific endeavour that can be dropped if funds are insufficient. The full science program must justify all aspects of the work. Failure to do so will undoubtedly be noted by the reviewers and will result in negative comments and down-ranking of the proposal.

2.3 Submitting a proposal

2.3.1 Proposal presentation

Although there are many variants in the required form of proposals, there are also major features in common that are geared to the nature of the assessment process. In many cases, some material has to be entered into electronic forms, with strict character limits for sections, whilst the remainder is submitted by, for example, PDF files. Formatting instructions need to be followed or the proposal can be rejected.

The main ingredients of a proposal are:

Cover material
This includes the title, abstract and necessary institutional information

Investigators
The proponents of the proposed work have to be identified and details given of their experience and capability. There is considerable variety in the specifications of such material and the instructions from the funding scheme need to be followed closely. Interruptions to research and unconventional career paths can be identified at this stage.

Box 2.1: ARC Proposal Headings for Science Component 2013

- Proposal Title
- Aims and Background
  - ◇ Aim of proposed work, with reference to outcomes
  - ◇ Background of research field in international context
  - ◇ Relation to proposal
- Research Project
  - ◇ Significance of research
  - ◇ How an important problem is addressed
  - ◇ Nature of outcomes, impact and innovation
  - ◇ Conceptual framework and methods
  - ◇ Research plans and time line
  - ◇ Feasibility of project - design, budget, time line
  - ◇ National economic, environment and/or social benefits.
  - ◇ Relation to National Research Priorities
- Research Environment
  - ◇ Nature of research environment in collaborating institutions and groups
  - ◇ Relation to institutional strategic plans
  - ◇ Communication of results
- Role of Personnel
  - ◇ Roles and contributions for main investigators
  - ◇ Roles and involvement of other participants
- References

Scientific justification

This is the main component of the proposal where a clear research goal and plan have to be expressed. It is here that the effort expended in developing a working plan for a research topic will be repaid. If the concept of the work has already been well developed with a clear expression of questions, hypotheses, and outcomes, then this can be built directly into the justification for the proposed work. This section is normally subject to fixed length limits and may also have prescribed structure. For example, Box 2.1 shows the required headings for the Australian Research Council (ARC) Discovery Scheme for 2013, together with the class of material that should appear in each section. This list gives a good indication of the topics that should be addressed in proposals, even where a more free form structure is allowed.

Budgets

The way in which budgetary information is handled varies markedly between schemes. Sometimes the budget is incorporated with the research plan, but frequently it is in a separate section. A standard budget form may be required or entries made in an electronic spreadsheet. Where

optional budget templates are provided it is worthwhile using them, since it will make the information easier to digest in the review process. In all cases the budget items need to be justified carefully and explicitly. Items that may receive particular scrutiny are travel and fieldwork, equipment, consumables and maintenance costs.

Results from prior support

Proponents are often required to report on the outcomes of previously funded projects, including those for which they may not be the main investigator. In some cases, for example, the U.S. National Science Foundation (NSF) this forms part of the science component. In others it appears as a separate section of the proposal.

2.3.2 Examples of proposal guidelines

Some aspects of the form of proposals can be explicitly geared to the class of criteria that will be used in project assessment. Thus, in the 2013 version of the *Grant Proposal Guide* of the NSF the following requirement is included:

> Each proposal must contain a summary of the proposed project not more than one page in length. The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, and a statement on the broader impacts of the proposed activity. The overview includes a description of the activity that would result if the proposal were funded and a statement of objectives and methods to be employed. The statement on intellectual merit should describe the potential of the proposed activity to advance knowledge. The statement on broader impacts should describe the potential of the proposed activity to benefit society and contribute to the achievement of specific, desired societal outcomes. The Project Summary should be written in the third person, informative to other persons working in the same or related fields, and, insofar as possible, understandable to a scientifically or technically literate lay reader. It should not be an abstract of the proposal.

The guidelines for the *Starting Grants* of the European Research Council provide a useful summary of expectations with respect to the expression of the objectives of the project and necessary background, as well as the project plan:

> *a. State of the art and objectives:*
> Specify clearly the objectives of the proposal, in the context of the state of the art in the field. When describing the envisaged research it should be indicated how and why the proposed work is important for the field, and what impact it will have if successful, such

as how it may open up new horizons or opportunities for science, technology or scholarship. Specify any particularly challenging or unconventional aspects of the proposal, including multi- or inter-disciplinary aspects.

b. Methodology:

Describe the proposed methodology in detail including, as appropriate, key intermediate goals. Explain and justify the methodology in relation to the state of the art, including any particularly novel or unconventional aspects. Highlight any intermediate stages where results may require adjustments to the project planning.

Note that it is expected that the project plan be dynamic, and therefore able to adjust to the nature of earlier results. It is not a weakness to anticipate critical points in the work schema, and to have alternative modes of attack depending on outcomes.

2.3.3 Before submission

Proposals need to be written in a simple, direct and concise style with a clear logical flow. Try to avoid over-dependence on highly technical language, though occasional use of jargon is almost inevitable. The use of subheadings can be helpful to improve the organisation of the material. A careful check should be also be made for instances of poor expression and grammar, and spelling errors. In short, you need to read the proposal as well as write it. Setting the material aside for a few days before reading afresh can help.

Figures prepared for publication may well be over-complex for a proposal and need too much explanation. Figures should concentrate on material that is important for understanding the new work proposed, rather than older work already accomplished. Compressing a figure into a small space can compromise the quality in the version seen by a reviewer. For a complex project a diagram indicating the interrelations of the different components can be helpful.

You need to start early enough so that there is sufficient time to carry out the proposal writing and necessary revisions, as well as seeking feedback from your peers. It can be particularly helpful to get a reaction from someone who is not in your field.

2.4 Proposal review

Once a proposal is submitted there is a natural inclination to relax and concentrate on research once again. But, in the meantime, your proposal will be starting on its track through the review process. It is helpful to understand the nature of the reviewing system, since this can assist in

Box 2.2: ARC Discovery selection criteria 2013

a. **Investigator(s)** (40%)
   ◇ Research opportunity and performance evidence
   ◇ Time and capacity to undertake the proposed research.

b. **Project Quality and Innovation** (25%)
   ◇ Does the research address a significant problem?
   ◇ Is the conceptual/theoretical framework innovative and original?
   ◇ Will the aims, concepts, methods and results advance knowledge?

c. **Feasibility and Benefit** (20%)
   ◇ Do the projects design, participants and requested budget create confidence in the timely and successful completion of the Project?
   ◇ Will the completed project produce innovative economic, environmental, social and/or cultural benefit to the Australian and international community?
   ◇ Will the proposed research be value for money?

d. **Research Environment** (15%)
   ◇ Is there an existing, or developing, supportive and high quality research environment for this project?

improving the design of projects. Experience gained in reviewing enables one to see a proposal in a different context. Even informal review of other people's projects can open your eyes to different styles of presentation and expression.

The first step in the formal process of review at a funding agency is the selection of projects that will be reviewed and the nomination of suitable reviewers. Such a process may involve a program manager or an expert panel.

The next task for the funding agency is to secure a sufficient number of external reviews. Normally at least two reviewers will be involved, but sometimes up to ten may be sought, particularly for very large projects. With the growth of scientific endeavours many calls are made on scientists' time and, in consequence, the rate of acceptance by nominated reviewers can be low. Certainly at the earlier stages of one's career one should accept such an invitation to review a proposal, if at all possible, because it represents an effective learning experience that may well help you in your own proposal writing. Further, you depend on the willingness of others to review your proposals, and so some reciprocity is required.

Conflict of interest rules generally preclude review of proposals involving recent collaborators, former students or advisors, and also from your own current or recent former institution or an institution with which

Box 2.3: NSF Proposal Review Criteria 2013

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to:
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

you have a regular working relation. The arrangements differ between schemes, but normally you will need to raise any potential conflict with the funding agency who may then determine whether the review can proceed.

Before starting the review it is important that the reviewer understand the general requirements of the funding scheme, and the nature of the assessment criteria. In some cases the selection criteria are presented explicitly — an example is provided for the Australian Research Council Discovery Scheme in Box 2.2 — and tied to the nature of the questions posed on the review form. Sometimes the information is effectively contained in the entries that are requested in an electronic review form. In other situations the merit criteria are clearly presented but the way in which they will be employed is not available to a reviewer. For example the U.S. National Science Foundation provides a detailed set of general instructions

to reviewers (Box 2.3), but the relative importance to be attached to the different components may vary with funding scheme.

Whatever the criteria being employed in the assessment it is important that the review process is fair, and judges a proposal on what has been written. Where critical comments are made they should be substantiated with appropriate information, rather than a bald statement such as 'this cannot possibly work'. A review should look for true innovation and give it due praise. In many cases both written comments and numerical or other rankings are required. These two different aspects of the assessment need to tally if they are to be used effectively.

Although it is common for reviewers' comments to be passed back to the proponents in some form, this should not inhibit a reviewer in making justified criticisms nor making constructive suggestions for improvement. Exaggerated language, either positive or negative, is not helpful for those who will use the review.

Some funding schemes invite commentary on the suitability of the budget, but others separate assessment of scientific merit and budgetary considerations. When assessing budgets you should be aware that the circumstances prevailing for the proponents may not correspond to those with which you are familiar. Costs are assessed in different ways in different countries, and often reviewers are not provided with the full instructions as to eligibility of costs.

Some funding agencies allow a response ('rebuttal') to the reviewers comments. Where available this should be viewed as a chance to seize on the positive aspects of the reviews, and also to blunt criticism. If a review is wrong then this needs to be pointed out politely, and the correct explanation given. The reviews and the responses will be commonly be seen at the final assessment meeting by panellists who will also have had an opportunity to see the proposals. This review panel will normally determine ranking lists, and may also have a role in determining funding.

Exercise 2-2:
Prepare a personal profile in the style required by your preferred funding agency. In some cases this may constitute a simple curriculum vitae, but others will have a more complex structure; e.g., including your best 10 papers with reasons for the choice.

Exercise 2-3:
Obtain a copy of a submitted proposal in a field different to your own and prepare a review based on the appropriate criteria for your preferred funding scheme, with both numerical scores and written comments (use a 1-5 scale, with 5 best).
This exercise is most effective if you can exchange and critique proposals with colleagues from another field.

2.5 The project proceeds

Congratulations, your project has been funded. Now you have to turn your concepts into reality. The first stage is the interface with your institution to get necessary agreements implemented, and administrative arrangements set in train. While this is happening it is a good idea to develop your project plan in full, with well-developed time lines and structures so that you can manage the progress of the project. In the next chapter we discuss the various considerations that need to be taken into account, and the project management tools that can aid the task.

Often you will want to recruit staff and this will require a different interface with the Human Resources structures so that advertising and appointment processes confirm to institutional rules. Students will commonly be involved with the project and this again invokes a different set of administrative requirements.

The main goal remains to pursue the scientific enterprise, and so it is good to get the work underway as soon as is practicable. You need to bear in mind needs for any intermediate reporting, which is often annual for major funding agencies, but more frequent with industrial sponsorship. Such milestones can be built into your project plan, so that they do not come as an unpleasant surprise that leads to interruption of the main effort.

Increasingly funding sources require explicit data-management plans with accessible archiving of data, so the protocols should be established at the beginning of the project to ensure that the appropriate *metadata* is registered. This is as much for your benefit as anyone else. If you need to go back on your tracks, the maintenance of good records by the entire project team will allow a swifter response to the changing direction of the work.

Hopefully, the project proceeds smoothly, but surprise is a constant factor in successful research. You therefore need to be prepared to exploit new insights and results with modifications to your plans. It is worth making a quick check before a change of direction to ensure that obligations associated with the funding will still be met, and also that there are no budgetary hurdles.

2.6 Project completion

As the funding period draws to a close there are a number of issues that need to be considered. Generally, submissions for additional funding for a cognate or different type of project will have been made by this time. The circumstances will then vary depending on whether new funding is available, or the current funding terminates and *ad hoc* measures have to be taken to maintain research.

Whatever the future state, you still have obligations to fulfil on the current project. Commonly a final report has to be rendered to the funding agency detailing the work achieved, the research outputs such as publications, and data management. This is the stage at which you will be trying to exploit the work achieved through conference presentations and publications with a broader overview. Good record keeping through the project, and thorough *metadata* attached to experimental results or simulation procedures, will aid the process of producing these major outputs.

The other step at the end of a project is the finalisation of financial accounts, so that expenditure is fully justified. Since financial reporting may well take a different path through an institution than the handling of research reports, you will have to ensure that necessary communication occurs. Many people's experience indicates that this is not something you can take for granted.