

# **HOW TO PREPARE A SUCCESSFUL GRANT APPLICATION**

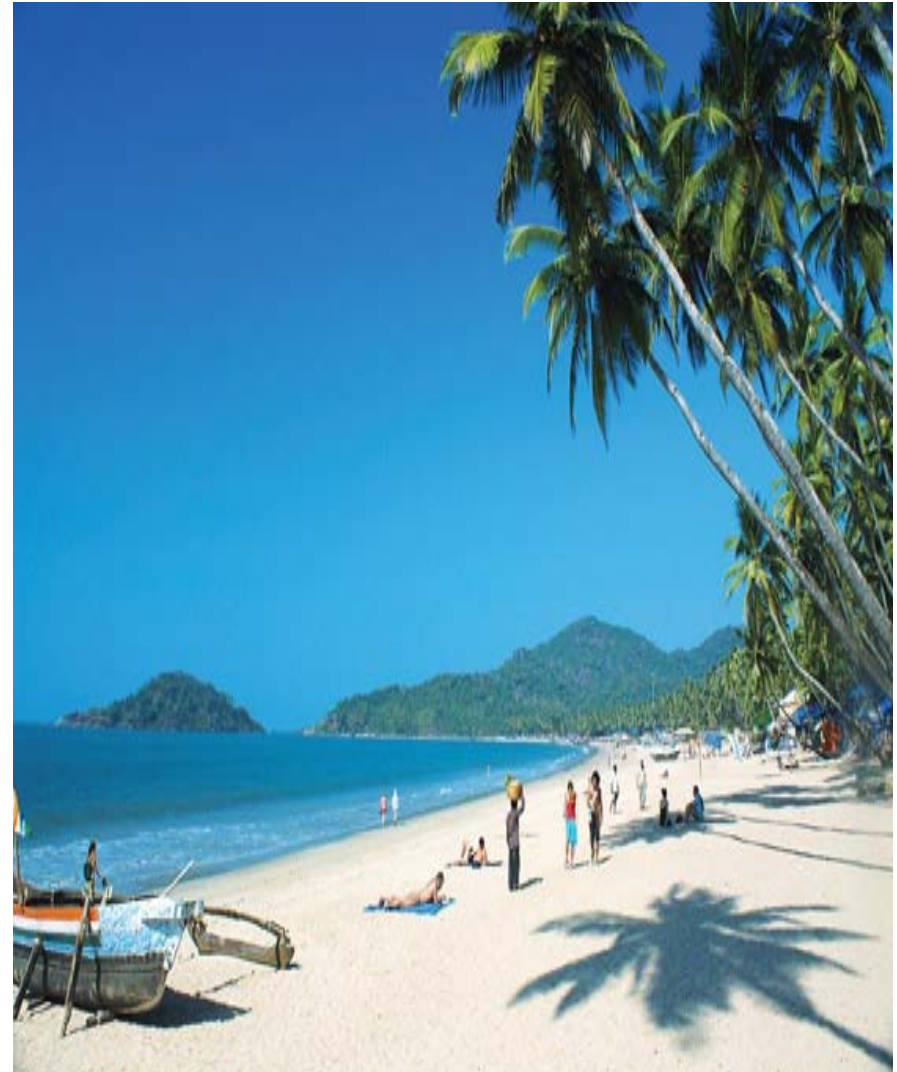
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**Personal reflections (there is no exact formula)**









# **A. Review Process: Example-Heart & Stroke Foundation of Canada**

**1.** Operating grant applications (about 400) are sent to Ottawa (September 1 deadline), and are distributed within 8 sub-committees:

- I Clinical cardio- and cerebrovascular research: mechanistic studies and clinical trials/health services research
- II Integrative studies: genetic manipulations, imaging, bioengineering
- III Basic science stroke/neurophysiology/neuroregulation
- IVa/b Cellular biochemistry, pharmacology & electrophysiology
- V Molecular basis of cardiac and vascular structure/function
- VI Thrombosis/lipids & lipoproteins/nutrition research
- VII Behavioral research/population health/rehabilitation/nursing research

2. The Chair and Deputy Chair of each sub-committee assign reviewers for each grant:

External reviewers (2)

Internal reviewers from sub-committee membership (2)

3. Scientific Review Committee, consisting of all 8 sub-committees, meets in Ottawa in early December, to make decisions based on **internal** and **external reviews** of the scientific merit of each application.

# HOW TO REVIEW A GRANT APPLICATION

(a) Read the **Progress Report** and the appended manuscripts (5-6). Even new applications should complete the Progress Report by including results of pilot experiments. Manuscripts provide detailed information on **methodologies**, and presumably the background to the application.

Manuscripts: assess content rather than relying on journal reputation; evaluate quality (novelty); be aware of “formula” publications; for renewals, monitor “acknowledgement of support”. Evaluate specific **progress in relation to previous grant funding**, not overall productivity.



**(b)** Read the one page **Summary of Proposal** (and perhaps the “lay” summary), to understand the scope of the research proposal.

**(c)** Evaluate the **Research Proposal** (research plan), emphasizing **strengths and weaknesses**.

Is this hypothesis-testing research or descriptive research?

# CRITIQUE

## **(a) Should this work be done?**

- rationale (a compelling idea?)
- context within scientific literature (referencing)
- novel or confirmatory?

## **(b) Can this work be done?**

- technical feasibility (burden of proof on the applicant)

## **(c) Will anticipated results actually test the hypotheses?**

- interpretation of experimental results
- consideration of alternative interpretations
- awareness of problems/acknowledge limitations
- logic of experimental approach/sequence

# **Review of an application from Charles Darwin to obtain travel funds to support his journey on the HMS Beagle as a naturalist.**

**Applicant:** Darwin has not demonstrated sufficient training in Biology to support his position as naturalist; a “passion for collecting” and a B.A. degree from Cambridge (1831) is not an acceptable alternative to post-graduate studies. Importantly, Darwin has not published any scientific papers in this area, although he states vague plans to write a book following the sea journey.

**Assessment:** The proposal represents a wish to go on an ambitious sea journey of indeterminate length.

No specific hypotheses are tested. Darwin proposes to collect and observe species of wild-life; this is descriptive data-gathering and will not, in my view, generate any new information.

Novelty? It is unlikely that any new examples of wild-life will be found in South America that are not well-described in England.

Feasibility? Very few experimental details are provided regarding methodology. No collaborative letter was provided by the Captain of the Beagle, Robert FitzRoy. Some information should have been provided regarding the specific destinations for this voyage. The absence of experimental details in the research plan is most disturbing.

In summary, Darwin's grant application is vague and unfocussed. In addition, there are doubts about the ability of the applicant to perform the study. Recommendation: **rejection** of the present application. Darwin should re-apply for a modest sum of money to perform a **pilot study** to test the feasibility of his proposal, perhaps on a short voyage to the Isle of Wight.

## 4. Committee decisions

(a) Primary and secondary internal reviewers declare their numerical ratings (0 - 4.9)

(b) Primary reviewer describes the grant (objectives, methodology) and provides his/her critique (strengths and weaknesses)

(c) Secondary reviewer provides additional critique and reviews the content of the external reviews

(d) The internal reviewers give their consensus rating (often but not always an average of their individual ratings)

(e) Committee members then vote individually, using the consensus rating  $\pm 0.5$

# RATING SCALE

4.5-4.9	Outstanding
4.0-4.4	Excellent
3.5-3.9	Very good
3.0-3.4	Solid/significant
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2.5-2.9	Needs revision
2.0-2.4	Needs major revision
1.0-1.9	Seriously flawed
0	Unacceptable (no scientific merit)

# FALLACY OF PEER REVIEW

**External reviewers** may decline to provide an assessment, either because of conflict of interest or more likely because of perceived lack of time (too busy). This produces a “trickle-down” effect as the application is sent to additional reviewers who may be less expert.

Many external reviews are of poor quality (superficial)

**Internal reviews will, therefore, carry the most weight in achieving the final rating.** The workload of internal reviewers must be balanced, meaning that some applications are reviewed by individuals who are **not expert** in the area.

# Cut-Off for Funding?

Cut-offs for HSFC grants are established by the Provincial Heart & Stroke Foundations, based on budgetary considerations. Most Provincial Foundations have a cut-off around 4.0.

CIHR cut-offs are established by the Council, and range very close to 4.2.

**Assume that your grant will have to be near-perfect to be fundable.**

HSFC budgets are established by the Provincial offices: CIHR budgets are set by the scientific review committees.



# **OTHER COMMENTS ON THE PEER REVIEW PROCESS**

External peer review is swamped because of the current practice of sending the same operating grant to multiple agencies (HSFC, CIHR and ....).

Increasingly, “lay” reviewers will be added to scientific review committees, in part to offer perspective on issues like relevance of operating grants to the mandate and mission of the granting agency.

# **B. PREPARATION OF AN OPERATING GRANT APPLICATION**

## **1. First Decision: Funding Source**

Traditional: CIHR/NSERC, CFI (infrastructure)

HSFC, Canadian Diabetes Association

Consider: **who will evaluate the application?**

Choice of Review Committee (HSFC as an example):

IVa/b Cellular biochemistry, pharmacology & electrophysiology

V Molecular basis of cardiac & vascular structure and function

Study the committee composition (potential internal reviewers)

Submit suggestions for external referees, and **exclusions**

## **Other funding sources**

CIHR: RFAs (Request for Applications)

NIH

New opportunities (USA: research into bioterrorism)

## 2. How much time will it take to prepare the application?

(a) General: **6 months** minimum, to accumulate essential preliminary data to support your hypotheses and to demonstrate technical feasibility, and to establish productive collaborations.

(b) Specific writing: **1 month FULL-TIME** (minimum)

### 3. Mechanics of preparing the application

Key issue: **clarity of presentation, because of the fallacy of anticipated peer review.** Imagine that a non-expert reviewer will be reading your grant application late at night. Style and grantsmanship is important.

Review general guidelines and instructions very carefully (web sites); do your homework.

Pay attention to rules about page limitations, font size and the use of one-inch margins; **do not annoy the reviewer!**

## 4. Sequence

(a) **Progress Report** (one page): establish productivity in relation to the previous grant (e.g., 1998-2003). Don't include a manuscript that was submitted prior to the granting period! Acknowledge complementary funding; be honest.

(b) **Research Proposal** (11 pages, exclusive of references and figures/tables)

(i) Introduction and Background Knowledge, with an indication of your specific progress. **Bold key statements and references (11) from your laboratory.** At the end of the Introduction (no more than 3-3.5 pages), clearly state your objectives, preferably as a central **hypothesis** or research **questions**. Restrict specific aims to about 4 for a 3-5 year grant; too many specific objectives will lead to criticism of lack of focus. **Mechanistic** aspects must be emphasized.

## (ii) Research Plan

Example: (1) **Can enhanced fatty acid utilization by diabetic hearts be observed in vivo?**

Rationale (brief).

Experimental protocols: interpretation of anticipated results and limitations (Years 1-3). Methods of analysis, including statistics, anticipated pitfalls with alternative approaches.

Future objectives (Years 4-5).

(2) **What biochemical mechanisms are responsible for enhanced fatty acid utilization by diabetic hearts? .....**

**Figures, schemes and tables** can be appended to provide information regarding the experimental approach. Use diagrams to clarify the protocols; figures to show feasibility of new techniques. Figure legends must be brief, however; methodology **can not** be presented in Figure legends.

### (iii) Summary and Significance

Why is this work important? How will this work advance our knowledge of scientific concepts?

Present a logical sequence with timelines for the work plan.

Emphasize unique aspects of the proposal such as multi-disciplinary approaches (e.g., use of intact mice, perfused hearts, isolated cardiomyocytes).

(iv) References: include titles; use **bold** font to identify references from your laboratory; be up-to-date.

Manuscripts (5-6, depending on the granting agency) can be appended, to document progress but also to allow inspection of methodologies.



(c) **Summary of Proposal** (1 page): **VERY IMPORTANT**

Must be clear, with a brief rationale and clearly-stated objectives (that must match those presented in the Research Proposal, obviously).

(d) **Operating Budget:** Be **REALISTIC**; balance what you need with what you are likely to be awarded.

(e) **CV Module:** basic information, common to most granting agencies.

(f) Other parts of the application: animal care certificate, letters of collaboration, quotes for equipment, etc. A true collaboration is much more compelling than a mere letter of support.

Manage your time so that other investigators can read your application for constructive comments, before submission to the local authorities for signatures and transport to the granting agency.

Be prepared for initial rejection and resubmission.

Notwithstanding that it is difficult to obtain an operating grant, be **OPTIMISTIC**.

Participate in Scientific Review Committees; it is your duty and responsibility, and very educational.