Laboratory; Mr H Walker, London Borough of Camden; and Mr G Woodcock, Harrow Driving Centre.

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How to do it

Apply for a research grant

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Success in applying for a research grant depends on producing clear evidence of a good question that needs to be answered; of a capacity to make a promising attempt at finding the answer; of reasonable opportunity to do the work in good conditions and within a defined period; and of the need for specified finance for stated purposes. The application will be read and assessed by experienced, sceptical officials—lay and scientific—and by chosen assessors—usually senior academics who have a good knowledge of the subject and a capacity for fair and reliable judgment of people and proposals. Answers to applications are seldom available in under three months; and it may take much longer, depending on dates of meetings, and whether the application is clear or vague (in which case the applicant may be asked to provide supplementary information). In some circumstances delays of six months are quite reasonable; applicants

should allow plenty of time, and find out from the grant-giving body the best date for submitting an application. Usually a standard application form has to be completed, and this should always be clearly typed, and suitable for copying. If the form does not allow enough space for a full answer under any of its headings, submit an appendix and indicate that you have done this by a note at the corresponding place on the form.

A good question to be answered

One of the distinguishing attributes of a good research worker is his ability to find good questions to be answered. A good question is one whose answer will matter. It may matter because it clarifies a fundamental issue of medical or pure science, or affects medical practice in some appreciable way. The answer must advance knowledge or understanding, which means that it must be more than a mere footnote. It must convey positive information. Negative findings, however useful to others working on the same subject, are not of themselves a good complete answer. Nor is it enough simply to provide an account of new methods for doing things without showing that the results mean something. "I'm not interested in recipes—only in puddings," said one leading assessor. So the applicant must

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identify the question to be answered and specify it in a clear and understandable way, quoting briefly the immediately relevant work on the same subject.

Capacity to answer the question

Inspirations drawn out of the air, even by the most ingenious minds, seldom appeal to sceptical assessors. But if the applicant has a new thought about a long unanswered question he has made a good start. Some people have found useful problems by reading three or four standard textbooks to discover statements that have obviously been copied from one book to another, and that are generally accepted as truth without having been properly tested in modern times. A good piece of observation of some unexpected finding during routine work is an excellent starting point, even if it is not by itself enough to make the basis of an application for a grant. It is almost essential to do, and preferably to publish, some unaided work on the chosen topic. If it can be given to and criticised by a scientific meeting, so much the better. This unaided work establishes that you have a valid starting point, that you stand on some foundation, and that you have some initiative and motivation. Grant-giving bodies, like wise generals, prefer to reinforce success, however modest, rather than to give money hoping that some purely armchair strategy may lead to a real advance.

There are no good questions on which an able research worker cannot make some progress without outside help. Evidence of motivation, initiative, and capacity are what assessors look for; and nothing is better evidence that they are backing a likely winner than proof that the horse has already jumped a few fences and knows what lies ahead. Those who are beginners at research, in the sense that their work is not yet well known, must always supply a curriculum vitae as well as saying what their problem is and how they hope to tackle it. The same information is required about any named collaborators still unknown to the grant-giving body. This kind of information is normally given in appendices.

Opportunity for work and evidence of need

Unknown applicants need to prove that they have the necessary accommodation and basic facilities for the work proposed. Usually these will be found in an established university department, good hospital, or practice whose head is known as a supervisor of research, and who supports the application in writing. Unknown applicants should not expect the grant-giving body to build or find accommodation for them, or to buy basic equipment such as microscopes, centrifuges, and laboratory furniture. Yet these are often asked for, and such requests cool the welcome given to the application.

Specialised apparatus and highly qualified technical help may be given as part of a grant, but only to workers of proved capacity and then only if they can show that the apparatus is essential, not reasonably to be provided for the applicant's ordinary work, and fully and accurately costed, preferably with manufacturers' specifications and quotations in support. Such information should go in appendices.

Duration of the research

How much time will the work require? And what will happen to the applicant and any collaborators when it is finished? With money hard to find for research, or for any advanced work, grant-giving bodies must ask these questions before deciding on which grants to support. Those who can live indefinitely and happily as full-time research workers are not all that numerous; so it is an advantage to see as clearly as possible what the applicant and his collaborators expect to live on when the grant runs out. Some, indeed, will adopt careers as full-time research

workers; but these are in a minority. So it helps to have at least the prospect of an established post when the grant ends.

It is also necessary to show a plan of work that may be expected to supply some sort of answer in three years at the most. This, in turn, may lead to an extension; but the grant-giving body must be shown that there is a sensible plan—statistically assessed from the beginning, if possible—to guarantee that the necessary observations can be made within the time from the material available, and that they will be competently documented in such a way that they may be analysed. Even if the answer is a lemon, the work should be so planned that even this harsh truth will be clear within reasonable time. Nothing is more chilling to grant-giving bodies than the fear that they are about to support an expedition into never-never land to discover goodness knows what.

A last word

How do you know that your idea is a good one? Well, you don't know; and neither does the grant-giving body. If you did know the answer in advance, the work would be too dull to be worth doing. But there are some obvious bits of applied work crying out for a yes or no answer, and it's not a bad idea to join a team on one of these projects just to see if you feel the genuine thrill of doing research—any research. Also, if you suddenly have a feeling that you're on to something so urgent and so obviously right that you're bound to have the answer in six weeks at the most, while it lasts you will have a single-minded obsession and happiness that cannot be surpassed; and you are probably at the start of something that will really matter. It may well destroy your original hypothesis; but it will probably keep you busy for years to come.

Eventually this series will be collected into a book and hence no reprints will be available from individual authors.

There appears to be sound evidence that less coronary artery disease is found in hard water areas than in soft. In a soft water area would it help to take those minerals that the water lacks? If so which, and in what form and dose?

Evidence of higher incidence of ischaemic heart disease in soft water areas comes from studying mortality rather than non-fatal disease rates. Areas with soft and hard water differ in respect of many variables other than their water supply. In England, for example, the soft water areas are mostly in the north and west of the country. It is not yet known whether the variations in ischaemic heart disease mortality depend primarily on the characteristics of the water or are secondary to personal, socioeconomic, climatic, or other variables. Soft and hard water differ in respect of several mineral constituents. Calcium, magnesium, and sodium are the main cations in drinking water; trace elements may also be important. The weight of current evidence suggests that it is unwise to soften drinking water supplies artificially, but beyond that no advice can be given.

The distillation of spirit from a sugar base is common among expatriates in a country where alcohol is prohibited. Complaints of side effects abound. What are the likely contaminants of home distillation and what problems may they cause?

Unfortunately, the writer does not say what is used in the fermentation process or what side effects have occurred. The likely contaminants of home-made alcohol are (1) the higher alcohols (congeners) of the distillation process and possibly excessive quantities of histamine, both thought to be the cause of the "hangover" type of side effects that are common with illicit distillation; and (2) metals and perhaps other impurities from containers used for distillation, of which lead, sometimes causing symptoms of poisoning, and iron, leading to haemochromatosis, are the best known.