clubs, wine, underwear and everything else under the Sun.

The binary combinations also lead us to assume something about the shop's owners. Faced with a specific set of circumstances, these businesses redefine what we expect from a shop and offer something distinct.

There are greater problems in the world than what to do with your vacuum cleaner while you decide what make of balls to buy, but the principle is worth remembering as you browse this week's special issue of *Nature*, which we dedicate to interdisciplinary science.

Most scientists are aware of the term, and many will have used it. But how many are truly engaged in it? Done correctly, it is not mere multidisciplinary work — a collection of people tackling a problem using their specific skills — but a synthesis of different approaches into something unique. It is the wine and underwear shop, not the hypermarket.

The best interdisciplinary science comes from the realization that there are pressing questions or problems that cannot be adequately addressed by people from just one discipline. Witness the gathering of the scientific tribes — and the merging of approaches — for the Manhattan Project to work on the atomic bomb. More recently, *Nature* has reported on 'implementation science', which combines medical expertise with local knowledge on how best to carry out programmes to improve public health (see *Nature* **523,** 516–518; 2015).

An interdisciplinary approach should drive people to ask questions and solve problems that have never come up before. But it can also address old problems, especially those that have proved unwilling to yield to conventional approaches.

Enough of the rhetoric, what about the reality? It is hard to deny that the scientific system — from funding streams and academic rewards to university departments and journals — does not encourage much overlap between disparate subjects. It is easy to set up a 'Centre for Interdisciplinary Research', but who will be prepared to join it? If governments, funders and universities want to encourage more basic researchers to leave their trenches, then they need to make the no-man's-land of interdisciplinarity a more welcoming place to build a career. The obstacles are many, as we discuss in the pages that follow.

Some groups have found ways to overcome these obstacles, and some high-quality interdisciplinary work is under way. What are the key lessons from these successes?

"True interdisciplinary science cannot be rushed."

Interdisciplinary science takes longer than conventional projects, and that makes it more expensive. Funders most accept and embrace this and hold their nerve if the pay-off from individual projects takes longer than expected.

True interdisciplinary science cannot be rushed, not least because the best course of investigation is rarely clear at the outset. Research questions must be assessed and decided with input from all involved. An interdisciplinary project cannot exist as one main subject that sucks in the majority of the resources and leaves the partners as orbiting satellites.

Communication is crucial. The varying use of language across disciplines might seem a superficial problem, but it is one that must be solved, or misunderstandings will undermine the foundations of the project. There must also be no hierarchy, or perceived hierarchy. All involved must be confident that colleagues from other disciplines use equal academic rigour and scientific standing, even if the methods used in rival fields seem alien. It takes time to see the value in other approaches. It takes an open mind to appreciate an appliance-mending golf shop. ■

Protection priority

All involved in animal research must ensure that rules for ethical experiments are observed.

More than a million people in Europe signed a petition earlier this year to halt research with animals. One reason why *Nature* and many scientists are able to defend these experiments is that all involved do everything they can to minimize pain and suffering. Animal experiments are approved only after thorough discussion and are carried out according to strict regulatory controls. Society sees the benefits of animal research, but it does not seek them at any cost.

When breaches of the strict rules that govern animal research occur, it is vital — to both supporters and opponents — that they are investigated thoroughly, and that lessons are learnt and shared. This week, *Nature* publishes a correction on its website that details such a breach of experimental protocol in a previously published paper (L. Raj *et al. Nature* http://dx.doi.org/10.1038/nature15370; 2015).

The relevant experiments grew tumours in mice as a way to test possible treatments. This type of study is common, as is the way they are approved and regulated. Researchers typically plan the experiments and then submit details to an institutional review board for approval. In making its decision, the board follows guidelines set out by a separate body charged with oversight of animal procedures — an institutional animal care and use committee. These guidelines are country-specific, and in the case of tumour experiments should include limits on the maximum tumour size allowed, and instructions to the researchers to monitor both tumour size and signs of distress.

In this case, prompted by a complaint from a reader and following consultation with the authors and the relevant bodies, *Nature* has established that the scientists did not carry out the required monitoring properly. As a result, some of the tumours grew larger than permitted. These mice could therefore have experienced more pain and suffering than originally allowed for.

As well as writing to correct their paper to mark the breach of animal-welfare guidelines, the authors apologize for the breach. They are right to do so. Cases such as this could provoke a justifiable backlash against animal research. All involved — scientists, institutions, funders and journals — must do more to ensure that regulations are strictly observed.

Nature's policy is that the corresponding author on a paper that reports experiments with animals must confirm that the research was carried out in accordance with the relevant rules (see go.nature.com/a9pjym). As a result of this case, we are increasing the amount of information we request from authors. In experiments in which tumours are grown, we now require authors to include the maximal tumour size permitted by the institutional animal-use committee, and to state that this was not exceeded. Authors must also provide the source data for any figures that analyse tumour growth.

Nature does not want to publish the results of experiments that have not been performed under ethical guidelines. As such, the authors in this case are correcting their paper to withdraw the portion of the data collected in experiments that the institutional committee concluded were in breach. The scientific conclusions of the paper remain valid and useful, and still stand.

Institutions should do more to make sure that the guidelines they set are respected. At the very least, on completion of each project — and before data are submitted — institutions should verify that approved protocols were followed. Funders and institutions must consider better training for young researchers doing work with animals. And the broader community should continue to scrutinize and improve how it carries out these types of experiment. Discussions are already under way, for example, on whether the control arms of similar cancer studies truly need to let (untreated) tumours grow as large as they currently do. *Nature* is happy to join these discussions and to help to improve practice. ■

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CORRECTION

The Editorial 'Too close for comfort?' (*Nature* **525,** 289; 2015) incorrectly stated: "In his defence, Folta argued that the money supported only travel and outreach, not research, and he was therefore under no obligation to disclose it". Folta did not say this. He said that he had complied with his university's disclosure rules.

CLARIFICATION

The Editorial 'Protection priority' (*Nature* **525,** 290; 2015) made reference to the fact that the mice in the experiments showed no visible sign of distress. That statement referred only to the animals for which the data were not withdrawn. The committee did not comment on whether or not the animals in the withdrawn experiments showed distress.