in the edifice. As various media outlets including *Nature*'s independent news team reported, errors were found in the figures, parts of the methods descriptions were found to be plagiarized and early attempts to replicate the work failed.

The problems that initially emerged did not fundamentally undermine the papers' conclusions. Moreover, replication of such work is not necessarily straightforward or quick, and the ability to use some techniques can be very sensitive to aspects of the experimental protocol.

Nevertheless, the RIKEN research centre in Japan, one of the institutions in which most of the work was carried out, promptly organized an inquiry and found inadequacies in data management, record-keeping and oversight (see go.nature.com/2vrjxs). One author was found guilty of misconduct — a charge that RIKEN reaffirmed following an appeal (see go.nature.com/tnxuhy).

We at *Nature* have considered what lessons we can derive from these flaws. When figures often involve many panels, panels duplicated between figures may, in practice, be impossible for journals to police routinely without disproportionate editorial effort. By contrast, image manipulation is easier to detect. Our policies have always discouraged inappropriate manipulation. However, our approach to policing it was never to do more than to check a small proportion of accepted papers. We are now reviewing our practices to increase such checking greatly, and we will announce our policies when the review is completed.

But only since the RIKEN investigation has it become clear that data that were an essential part of the authors' claims had been misrepresented. Figures that were described as representing different cells and different embryos were in fact describing the same cells and the same embryos.

All co-authors of both papers have finally concluded that they cannot stand behind the papers, and have decided to retract them.

The papers themselves have now been clearly watermarked to highlight their retracted status, but will remain hosted on *Nature*'s website, as is consistent with our retraction policy. (In our opinion, to take down retracted papers from journal websites amounts to an attempt to rewrite history, and makes life needlessly difficult for those wishing to learn from such episodes.)

We at *Nature* have examined the reports about the two papers from our referees and our own editorial records. Before publishing, we had checked that the results had been independently replicated in the laboratories of the co-authors, and we regret that we did not capture the authors' assurances in the author-contributions statements.

We have concluded that we and the referees could not have detected the problems that fatally undermined the papers. The referees' rigorous reports quite rightly took on trust what was presented in the papers.

***"We at* Nature *have considered what lessons we can derive from these flaws."***

For more than two years, *Nature* has been publishing articles that highlight the problems that can arise in the analysis and publication of the results of biomedical research. We have also launched several initiatives to improve our own rigour. For a collection of relevant content, see go.nature.com/huhbyr.

Underlying these issues, often, is sloppiness, whether in the handling of data, in their analysis, or in the inadequate keeping of laboratory notes. As a result, the conclusions of such papers can seem misleadingly robust. Another contributory factor lies in selection bias behind the data presented, whether implicit because the experiment was not randomized or blinded, or explicit in the deliberate selection of data that, usually with honest good intentions, are judged to be representative. (This is not to say that randomizing and blinding is always required, but more is needed than currently occurs.)

A manifestation of these problems has been a growth in the number of corrections reported in journals in recent years. It is hoped that the extension of our methods sections, the addition of a checklist intended to improve the standards of reporting, and our use of statistical advisers will reduce these problems in *Nature*.

In short: although editors and referees could not have detected the fatal faults in this work, the episode has further highlighted flaws in *Nature*'s procedures and in the procedures of institutions that publish with us. We — research funders, research practitioners, institutions and journals — need to put quality assurance and laboratory professionalism ever higher on our agendas, to ensure that the money entrusted by governments is not squandered, and that citizens' trust in science is not betrayed. ■

# Science and war

*As the centenary of its outbreak approaches,* Nature *looks back on the First World War.*

Safe in the twenty-first century, it is easy to look back at the terrible events of 1914–18 and wonder how the world turned on itself with such ferocity. Despite a century of continued conflict, the images of the First World War remain branded on our collective consciousness — the trenches, the barbed wire, the gas masks, the mud, the misery, the slaughter on an industrial scale.

The Great War was more than a clash of armies. It was a fight for supremacy in Europe and a battle to harness applications of science and technology. For the first time, machines gave the bulk of the advantage to the defenders. Science set about correcting that — an effort that climaxed in fire and fury with the dropping of atomic bombs in 1945.

Almost a century since the war broke out, *Nature* this week publishes intriguing takes on the conflict. In a Comment on page 25, Patricia Fara analyses the implications of the wartime move to recruit women into laboratories and factories. And on page 28, David Edgerton applauds writer Taylor Downing's effort to delve beneath the clichés of history and unpick how the conflict built on science from many fields. Much of that work was described in this journal, and *Nature* this month delves into its treasure trove of an archive to publish a collection of articles from the time, including editorials, news, correspondence and book reviews, available at go.nature.com/zhlclo. Most are directly relevant to the war, but some report on other events that have entered history: the Antarctic voyage of explorer Ernest Shackleton, for instance, and work on "gravitation and the principle of relativity" presented by one "Prof. A. Einstein".

Others give a flavour of academic life. Surprisingly (or not), little has changed. There are squabbles about advertising for staff while candidates are at war; grumbles about a lack of resources (only poor-quality rubber was available for research balloons, so many burst) and a sniffy response to suggestions that scientific societies cancel their meetings. Perhaps most pertinent are articles that show how central science was to the war effort: a few days after allied troops were first gassed at Ypres, for example, a *Nature* analysis pinpointed chlorine as a probable culprit.

A warning: *Nature* at the time was rooted in the British Empire. That, and a wartime anti-German sentiment, means that some opinions and terms are not in keeping with today's enlightened internationalist attitudes. Apologies for any offence but, well, there was a war on.

The articles are bookended with striking editorials. The first, from September 1914, pointed out that Britain must restructure its industry "broadly based on science". The final piece, published days after the Armistice in 1918, presciently warned that morals must advance with scientific knowledge, "for it is possible to conceive of a time when the forces at man's disposal will be so strong that a hostile army or an enemy's city may be destroyed almost at the touch of a button". The war to end all wars was only the beginning. ■

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