too many parties were involved, as negotiations could have become unwieldy and agreement less likely.

Collaborations between university and industry can bring large benefits: more resources to university faculty and students, faster dissemination of research results, new products on the market, and fresh insight from interactions that might not otherwise have happened. But such collaborations can be difficult to manage because universities and industries have different objectives.

In short, *Universities in the Age of Corporate Science* is a compelling and detailed description of the events surrounding the UCB–N deal. It should be enjoyed by all those who follow the evolution of university–industry relations, offering as it does a unique look at how the collaboration was made. ■

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Builders with little brains

Animal Architects: Building and the Evolution of Intelligence
by James L. Gould & Carol Grant Gould
Basic Books: 2007. 316 pp. $26.95

Tore Slagsvold

Running, climbing, diving and surviving in extreme environments are just some of the physical skills in which animals excel compared with humans. But we are confident that our bigger brains make us better at tasks demanding intelligence. Take building, for example — we can build cars, houses and castles. But to what extent is intelligence actually needed to be a good architect and builder, and are humans really unique in this respect?

These questions are raised by James Gould, professor of ecology and evolutionary biology at Princeton University, and science writer Carol Gould in their book *Animal Architects*. They point out that tiny termites can build a tower 6 metres high. Taking relative body length into account, this would be equivalent to about a height of about 4 kilometres for a human, making the Eiffel Tower and the Empire State Building seem very small indeed. Even in absolute size, coral reefs — the largest structures built by animals and the only signs of life on our planet that are visible from space — are beyond the scope of human creations.

In this book, the authors show how spiders build webs with silk to catch their prey; how a silkworm weaves its cocoon around itself; how honeybees use wax to build precise hexagonal combs for their young and for honey; how paper wasps masticate materials from twigs with water to make damp cellulose for their combs; and how insects get air-conditioning for their homes. Birds are also sophisticated builders of nests. But building skills are generally less developed in mammals, as the safety of the womb renders additional prenatal protection redundant — although there are some notable exceptions, such as the beaver.

Does building call for great cognitive ability? Not necessarily, say the authors, who use knowledge from ethology about sign stimuli, motor programmes and motivation to explain how impressive constructions can be built from many small steps. This explanation seems plausible — after all, I can cook a complex meal by following a detailed recipe, and I may even be able to build a small cabin.

The question of intelligence is integrated into the whole of the book, which is a notable achievement. The authors even offer a provocative analysis of one of our own skills that we consider to be very advanced — language learning — and show that it is based on a simple chain of built-in recognition systems for sign stimuli and on innate motor programmes. Such innate behaviours do not preclude the existence of higher cognitive processes, however: indeed, these allow us to perform largely on 'autopilot' while focusing on whatever cognitively challenging task arises.

We also believe we have a unique aesthetic sense, yet some animals, such as bower birds, build small huts decorated with colourful objects. The bower's only purpose is to help attract a mate. Bower birds are considered to be intelligent, suggesting that recursive cycles of selection for a single set of cognitive building abilities and aesthetic refinements are part of the same sort of positive-feedback loop that may have led to the evolution of the human mind. Well, parrots and crows are smart too, but most parrots do not build nests, and crows make only simple nests from sticks (albeit with a lining). The evolution of bigger brains may have more to do with sociality and the necessary communication skills. Humans have no impressive evolutionary past as builders and originally lived in simple caves. But we used tools for hunting and fighting, and the authors may be correct in saying that such skills contributed to brain evolution.

The illustrations in this highly readable book are in black and white, which does not do full justice to the animal architects' remarkable achievements. Each of the ten chapters has a separate list of literature for further reading, but as references are not included in the text it is hard to figure out what is new and which contributions are the authors' own.

Animal constructions are fascinating, and the authors provide some useful insights into them. They show how the creation of complex constructions depends on evolutionary history and the investment of time and energy. Although the builders may not be particularly intelligent, their buildings serve their purpose well and confer fitness benefits on the architects. Could it be that our own building activity is driven not only by the need to shelter from the storm, but also by the desire for power and mate attraction? ■

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Attractive design: male bower birds build nests adorned with colourful items in a bid to lure a mate.