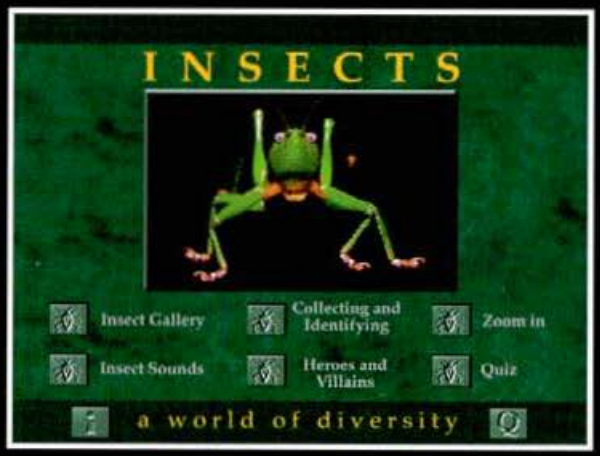

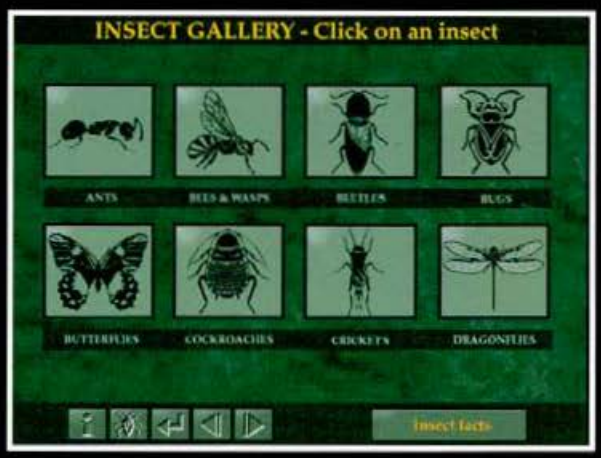

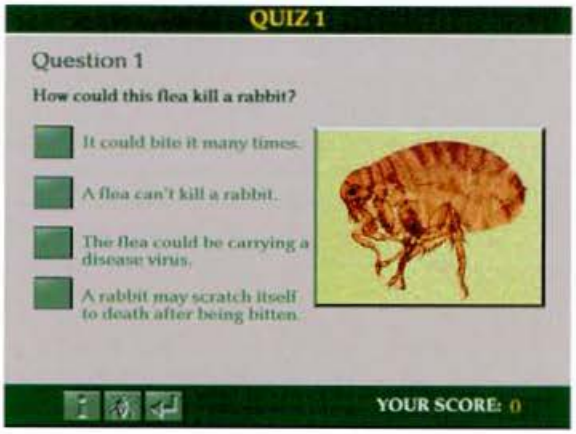

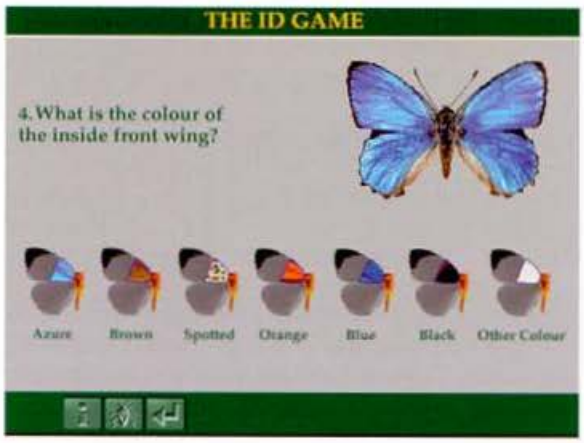

a bug for L

Why do flies rub their forelegs together? . . . To clean their feet after walking on your dinner. How fast can a dragonfly fly? . . . Up to 58 kilometres an hour. What is an insect? What is a bug? How many insect species are there in the world?

The answers to these questions, and to hundreds more, can be found in *Insects – a world of diversity*, the first interactive, multimedia CD-ROM to be produced by CSIRO.

'Insects' presents in one tiny package the most intriguing and important aspects of the insect world: a sort of 'sporting highlights' of their amazing characteristics and the special reasons for their existence.

Most of the sights and sounds captured on 'Insects' come from the Australian National Insect Collection, part of CSIRO's Division of Entomology at Canberra. The collection houses 11 million specimens and is an information source for taxonomists, entomologists, ecologists and land managers.

But why should they have all the fun?

Entomology (the science of studying insects) may seem dull to some of us, but maybe that's because the knowledge has always been too vast, and too microscopic, to share. With CD-ROM technology, however, text, sound, graphics and video can bring information to life, making learning more like entertainment than work.

The challenge of bringing insects to life on CD-ROM was met by the Division of Entomology and CSIRO's Communication Services group, led by Nick Alexander. His staff specialises in explaining and promoting science, and has produced many educational videos and interactive programs for public exhibitions. These include *Will Pigs Fly?* about genetic engineering; *Universe Explorer*, for the visitor centre at Parkes Radio Telescope; and *GeoExplorer*, about the decisions involved in finding mineral resources.

The producers appraised other educational CD-ROMs before starting work on 'Insects', discovering that many were just 'electronic books'. In contrast, they decided to

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design interactive activities that would encourage exploration and learning.

These activities have been grouped into six sections on the 'Insects' CD-ROM. The sections, accessed from the main menu, are: Insect Gallery; Insect Sounds; Collecting and Identifying; Heroes and Villains; Zoom In; and Quiz.

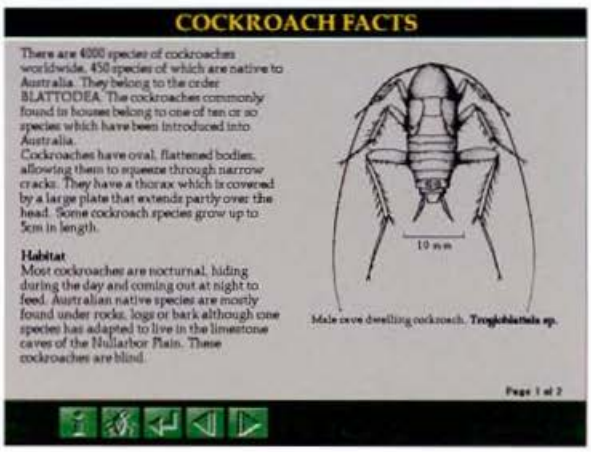
A collection of more than 200 Australian insects, arranged into 16 groups, are presented in the Insect Gallery. Each insect is shown photographed in colour with its scientific and common name (where applicable). Many also have a close-up picture and some have a sound button to hear the insect's call.

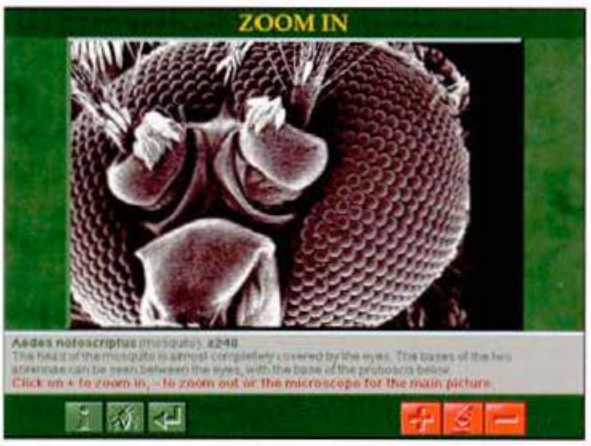
Accompanying each insect group is text outlining their habits, habitats, foods and life cycles. There are also lots of 'interesting facts' which explain fascinating insect behaviour such as mimicry, camouflage, sounds and adaptations.

For example, 'lacewing facts', describes the hunting practices of the banded antlion, *Glenoleon pulchellus*. Its larva catches ants by digging a funnel-shaped pit and lying in wait at the bottom, concealed by sand, with only its open mandibles visible. When an ant falls in, the antlion prevents its escape and may throw small bits of gravel at it.

Four insect groups – cicadas, katydids, crickets and others – are included in the Insect Sounds section. The sound recordings are accompanied by oscillograms: graphical representations of sound scientists use to help define the songs of each species and to distinguish between them. A slow-sound button plays back the insect call at 25% of normal speed. This makes it easier to understand the mechanics of sound production.

And these 'mechanics' can be pretty amazing. The loudest known insects, cicadas, generate sound with a pair of ribbed membranes beneath their wings called tymbals. A muscle attached to the inside of the tymbal contracts quickly, causing the still cuticle of the tymbal to 'pop' like the end of a soft drink can. This is done between 200-400 times a





Noel Butcher

Learning about insects can be fun. *Insects – a world of diversity* offers tips on where to look for insects, the kind of tools needed to collect them, and how to identify different species. It also describes the important roles played by insects in the environment, and their fascinating adaptations and behaviour.

second. The quality of sound is affected by the frequency of pulses and the size and shape of abdominal air cavities which act as resonating chambers. One cicada, *Cicadetta stradbrokensis*, even supplements this normal calling song with wing clapping!

Heroes and Villains features six short movies that explain important roles played by insects in the environment. Termites are portrayed as heroes because their activities are vital to the ecological balance of many areas. They return nutrients to the soil and are an abundant food source for animals such as birds and small mammals. Another hero is the 'thistle buster', a weevil called *Larinus latis* brought to Australia by scientists from the Division of Entomology to control the weed, Scotch thistle.

The Helicoverpa moth, on the other hand, is one of the villains. This 'green-eyed monster', in its caterpillar stage, feeds on most of our major crops. Through sprays and lost production, it costs Australian farmers about $200 million a year.

The Zoom In section shows how looking at insects in detail can help scientists to learn more about them. The images are created with a scanning electron microscope, or SEM, which directs a beam of electrons at a specimen in a vacuum chamber. The insect is preserved so that it doesn't change shape in the vacuum and then coated with gold. The electrons interact with the gold to produce an image which is displayed on a monitor. The result is an image at magnifications of up to 50 000 times, which appears to be three dimensional because of its great depth of field.

Looking at images with this level of detail is like entering another world. Insects loom ominously like science fiction monsters. From an ant's eye view the insect world is a formidable place where an encounter with a common garden beetle may be terrifying.

How to catch, preserve and display insects is explained in Collecting and Identifying. This section encourages the exploration of home gardens or local parks and features an interactive garden acitivity and identification game. When the various insects are located, their names and characteristics are described. For example, clicking on a pair of gumboots at night reveals the three-horned scarab beetle which had been attracted by the outdoor light and fallen into a gumboot.

The 10 quizzes in 'Insects' feature photos, sound and text, and are designed to build on the information presented in the other segments.

Insects – a world of diversity runs on an Apple Macintosh computer with a 13" colour monitor (or larger), 4Mb of RAM and a CD-ROM drive. The minimum configuration needed to run the Windows version is a 386 computer with Super VGA video card or monitor, 4Mb of RAM, Windows 3.1 or later, a Windows-compatible sound card and a CD-ROM drive.

'Insects' is also available as part of an educational kit designed for upper primary and secondary level students. The kit includes a teacher's guide, student worksheets and suggested activities along with all the text information from the 'Insects' CD.

The CD costs $99, or $119 including the teacher's kit. Contact: CSIRO Bookshop, PO Box 89, East Melbourne, Vic. 3002, (03) 418 7217, fax (03) 419 0459, or Video Education Australasia, Level 1, 111a Mitchell Street, Bendigo, Vic. 3550, toll free phone (008) 03 4282, fax (054) 41 1148.