

**LLEWELLYN Anne & SANDERS Christine**  
**Interdisciplinary Links – the Art of Science and the Science of Art**

**Abstract**

In 2003 the University of Newcastle introduced the Bachelor of Illustration (Natural History) re-establishing a successful collaboration between art and science. This program is unique to higher education in Australia and seeks to blend the life sciences, art and design. Formerly known as Wildlife Illustration this study strand was aligned to Fine Arts and after various university restructures to Design. Despite many upheavals and a new focus it is currently situated in the Faculty of Science and Information Technology where new interdisciplinary challenges are bringing forth a wider range of creative research opportunities.

Collaboration between researchers and students in art, design, science and I.T. has resulted in a number of non-traditional projects. These collaborative ventures include biodiversity and installation, biophysics and botanical illustration, palaeontology and 3D modelling. Examination of these projects also requires diversity of expertise across the broad range of disciplines, resulting in the potential for new interdisciplinary and cross-institutional research collaborations, in particular the 'creative' (arts) and the 'credible' (sciences). This paper seeks to explore such collaborations and outcomes.

**Biography – Anne Llewellyn**

Anne Llewellyn has worked as a wildlife illustrator/artist for many years. Working collaboratively with partner Herbert Heinrich she has been engaged in projects from artistic consultant for the N.S.W. National Parks and Wildlife Service, designing and coordinating exhibitions for the Agricultural, Horticultural and Industrial show, co-authoring and illustrating *Remnants of Green* a book on rainforests of the Hunter Valley region as well as many and varied contracted illustrative projects and gallery exhibitions.

After completing a BA (VA) and Graduate Diploma in Art, Heinrich and Llewellyn established 'Wildlife Encounters' a conservation framing and wildlife art business which they ran from their rural property in the Hunter Valley of N.S.W. Adjoining Wallaroo Nature Reserve, the property provided the stimulus for their study of Australian flora and fauna. In 2002 Llewellyn completed a research Masters in Design with a thesis titled *The Art of Communicating Environmental Information* and is currently conducting research towards a PhD. This year Llewellyn was appointed as a lecturer in the new Bachelor of Illustration (Natural History) program at the University of Newcastle and looks forward to contributing to the development of this unique area of study.

Llewellyn is particularly interested in the role of natural history illustration in environmental education and awareness.

**Biography - Christine (Ross) Sanders**

Senior lecturer and Program convenor for Natural History Illustration in the School of Design, Communication and Information Technology at the University of Newcastle.

Educated at the National Art School Sydney (Dip. Painting), taught painting/wildlife illustration N.A.S. Newcastle, N.C.A.E., H.I.H.E and the University of Newcastle.

Professional experience includes, the inaugural Head of Dept. of Design, University of Newcastle; artist in residence, S.A. School of Art; art critic A.B.C. radio and Newcastle Morning Herald.

Overseas experience includes a studio in Britain for twelve months.

Solo and major group exhibitions have been held at venues in State, regional and commercial galleries in Australia with representation in both public and private collections in Australia and overseas.

Awards and grants for painting including, an Australia Council Grant, a small ARC grant and internal research grants from the University of Newcastle assisted in the development of research and these topics include:

Hidden images – species survival through camouflage and fossil form.

Watermarks – The exploration of tidal flow in combination with human intervention and its effect on marine activity.

Minescapes – The exploration of arid zones through the intervention of mining activity.

## **Interdisciplinary Links – the Art of Science and the Science of Art**

..there may be deeply shared philosophical foundations grounding science and aesthetics, but in the twentieth century such commonality has become increasingly difficult to discern.<sup>1</sup>

The University of Newcastle has offered studies in wildlife illustration (originally known as plant and wildlife illustration) since 1979. The specialisation was added to the Fine Art program by Professor Graham Gilchrist, who saw the need for this area of study in Australia and which he believed could emulate successful programs in the United Kingdom. The program was embraced by students with an interest in Australian natural history, and a Graduate Diploma was added to the specialisation. The Graduate Diploma has subsequently become an Honours year and attracts students both nationally and internationally. The program is atypical in that it accepts students from a range of undergraduate backgrounds including graphic design, science and fine art and because it is the only program of its kind in Australia and one of only a few in the world, draws students from all States of Australia and countries including New Zealand, USA, Canada, Greece, Switzerland, Brazil, Norway and South Africa.

The relocation away from Fine Art and into Design in 1998 resulted in a loss of specialisation opportunity for students wanting to concentrate on wildlife illustration. Instead students were offered a generic illustration option with only two specialist wildlife and scientific electives within the Bachelor of Design (Visual Communication) program. The newly appointed Professor in Design, Antony Eddison, however, acknowledged that the specialisation needed to be developed further and a new Bachelor of Illustration (Natural History) commenced in 2003. Unique to higher education in Australia, this program seeks to blend the life sciences with art and design.

The three year undergraduate program consists of a core of studio and field studies which are run in parallel to each other. At first year level, technology and drawing courses are offered from the Bachelor of Design (Visual Communication) program. From second year, students can elect courses from the earth sciences, design and fine art discipline areas and can tailor their program for their own needs and interests. Meritorious students can progress to the Honours, Masters and PhD programs.

To expose students to the broadest range of research interests we rely on associations with organisations such as the Australian Museum, C.S.I.R.O., Royal Botanic Gardens and N.S.W. National Parks and Wildlife Service. Students are encouraged and assisted in gaining access to collections and specialist personnel from each of these organisations to assist them in areas of particular research interest.

### Developing a Research Culture

Analysis, emotion and sensibility are integral components of both the scientific and the artistic process. The three levels of aesthetic experience – sensual, emotional/imaginative and analytical – are common to the experience and process of science and art.<sup>2</sup>

Like many areas in the creative arts, research within the university context in this specialist area is in its infancy. Though there is no shortage of students interested in pursuing higher degrees, adequate supervision particularly at PhD level is not always readily available. Now located within the Faculty of Science and Information Technology, understanding of the specific requirements and quirks of the devotees of natural history illustration is slowly developing. Perhaps we are fortunate that the subject matter makes it comprehensible to those colleagues from within the sciences.

Students in the area of Natural History/Wildlife Illustration cover a wide range of research interests and illustrative approaches. For the purposes of this paper we will describe three research projects undertaken by students who have successfully submitted for the award of Master of Design. The fourth research project was a collaboration between staff at the University of Newcastle and Macquarie University.

Research conducted by Roslyn Earp titled *The Exploration of Colour in Australian Flora and Fauna with Particular Reference to Red* explores the way in which biological organisms use light to produce selective colours by means of structures and pigments. She acknowledges that two mechanisms are responsible for colour in biological systems: ‘These are pigments and the manipulation of light from

within microstructures on the surface of the organism, producing optical effects such as diffraction and interference, called structural colour'.<sup>3</sup>

Earp's undergraduate degree was a Bachelor of Science with honours in Visual Communication (Wildlife Illustration). Her Masters thesis is a support document for a substantial exhibition of artwork which includes images of organisms that were selectively studied for their aesthetic attraction. The written thesis describes the mechanics of light and colour and how these pertain to nature and in particular the flower of *Doryanthes excelsa* and the insect *Tectocoris diophthalmus*.

The scientific research for this project included examination of both plant and insect specimens with the aid of an Electron Scanning Microscope (S.E.M.) located at the University of Newcastle, Environmental Scanning Electron Microscope (E.S.E.M.) located at the University of Technology, Sydney and after the preparation of fine sections at the University of Sydney, a Transmission Electron Microscope (T.E.M.).

Earp's research concludes that the flower of *Doryanthes excelsa* or Gynea Lily produces the colour red by way of pigments contained in the cells lying directly under a single layer of cuticle. The insect *Tectocoris diophthalmus* contains structural iridescence obtained by the combination of multi-layers of chitin and air which produces constructive interference colours of blue-green. She states in her conclusion:

..colour, for the flora and fauna of Australia is a vital and integral part of the adornments, they must advertise and identify to those that possess good colour vision. Each has modified their colour over generations and time to stand as evidence of the success of their particular methods of colour production.<sup>4</sup>

Research conducted by Anne Llewellyn titled *The Art of Communicating Environmental Information* acknowledges and examines the way Australian Aboriginal art, colonial and contemporary Australian wildlife art is used to interpret aspects of the Australian natural environment. Historically the environmental knowledge of Aboriginal Australians has been largely overlooked though Aboriginal depictions of the environment date back many thousands of years. The world occupied by Aboriginal Australians was not static and they were affected by vast climatic changes and sea level fluctuations. Their artwork both documents and confirms these variations.

The European invasion of Australia saw a noteworthy collaboration between scientists and artists where the material collected was drawn and described at the time of acquisition or soon after. The collaboration is described by Olsen as 'arguably the time when art and science were most in unison'<sup>5</sup> and by Flower 'as the time when explorers, scientists and artists were expected to get it all down, get it right, and if possible, bring back the evidence'.<sup>6</sup> Initially the ensuing settlement did not have the benefit of trained scientists or natural history artists, but rather relied on the talents of a mixed group of amateurs and professionals, adventurers and explorers to record the 'new' landscape. Painting in the colony suffered from not only a plethora of the unfamiliar and strange but also the lack of availability of paper and art materials.

The artwork accompanying this research is described by Llewellyn as follows:

Each image contains natural history information observed over a ten year period and the ten artworks collectively describe the study area over the cycle of one year. In order to portray information in a most interactive way, I have used shop mannequins as a surface on which to express myself. The choice of mannequins as a 'canvas' reveals another level within the work; as the mannequins are all female forms they serve to enforce the concept of cycles, the 'nurturing of the environment' and the recognition of the 'Earth Mother'. My use of the mannequins is a metaphor, they place human forms in nature, as part of the whole rather than merely observers removed from it. They also link the contemporary depiction of a place with the body painting practiced by Aboriginal Australians. As the world rockets towards consumerism and technology, we often lose sight of our dependence on the 'natural' environment in which we live. Nature is often regarded as 'something or somewhere out there', remote from us and viewed by us as the enemy.<sup>7</sup>

Anne Llewellyn is now enrolled in a PhD and is developing a fieldwork methodology for natural history illustrators subtitled: *Is there method in the madness?*

Sonya Naumov's research titled *Breaking Tradition: The Changing Face of Wildlife Illustration* examines the way computer and digital technology can be used in the production and dissemination of wildlife illustration to a broad audience. The study investigates computer technology as a tool in the production of illustrative artwork and the digital distribution of wildlife illustrations. Conducted between 1997 and 2000, Naumov surveyed four groups: wildlife illustrators to assess what techniques they used, the general public to ascertain their preference for traditional or digital illustration, children and the general public where she sought responses to exhibitions of her own illustrations in which she used a combination of traditional and digital techniques. By using such indicators as comparing the quality and efficiency of production, focusing on accuracy, detail, spontaneity, texture, symmetry and time efficiency and disseminating the images by presenting them on Internet websites, in multimedia presentations and in printed form, Naumov sought audience feedback on their preference for digital or traditional media.

The study concluded that computer technology could be efficiently utilised as an illustration tool especially in the areas of preparatory sketches and layout, image storage, image transfer (email and Internet), three-dimensional rendering and where interactivity and movement are required. Naumov also successfully employed digital technology in scientific illustration stating that 'Digitally scanning specimens (in this case insects) in most instances provided extra detail and information compared to using microscopes and projection devices alone and produced results in much less time'.<sup>8</sup>

Responses in audience approval varied but indicated that generally younger people were more accepting of digital technology whilst those aged over 45 preferred traditional forms of image dissemination such as in books and exhibitions.

Some drawbacks experienced by Naumov in the use of computer technology and noted in the survey results included the problem of viewing the entire illustration if the original is larger than the monitor and reduced enjoyment in the creative process experienced by some illustrators. The majority of wildlife illustrators are still using traditional methods though some are using digital technology to some degree.<sup>9</sup>

The fourth project described in this paper is a collaboration between staff of the Macquarie and Newcastle Universities. In 2002 Dr Andrew Simpson, Education Officer and palaeontologist from Macquarie University sought the assistance of staff from the University of Newcastle to build a dinosaur for inclusion in an exhibition *Palaeographia* to be held in conjunction with their international palaeontology conference. The exhibition, held at Macquarie University's art gallery, was opened by John Wolseley and included the work of Christine Sanders from the University of Newcastle and a variety of invited artists who worked in related themes including John Wolseley, John Olsen, Ann Musser, Jorg Schmeisser, Peter Trussler, Fred Williams and Fiona Macdonald.

Wildlife illustrators Herbert Heinrich and Anne Llewellyn were provided with information previously sourced by Dr John Lusk and began researching appropriate construction methods. Though only small, about the size of a small cow, *Minmi paravertebra* is Australia's only known Ankylosaur or armour-plated dinosaur and was named after the location of the fossilised skeleton, Minmi Crossing in Queensland. With the help of Dr Lusk and the staff of the National Dinosaur Museum, the shape and external skin texture was established and after sculpting a clay model, a silicone mould was made. From this the dinosaur was cast in a fibreglass and water-based resin with an outer flexible and tactile skin made from a thermosetting polyurethane. The presence of protective, external, bony structures known as scutes which protrude through the softer skin tissue, presented particular difficulties. These were eventually overcome by using the two-part casting method. As the animal was presumed to have inhabited riverine valleys, this helped determine the skin colouration. The reconstructed *Minmi paravertebra* is now permanently located in the Biological Sciences display at Macquarie University together with a cast of the fossilised animal.

In summary, contrary to Tauber's observations quoted in the opening paragraph, at the University of Newcastle at least, researchers are embracing the opportunity for cross-disciplinary collaborations. The location of the Bachelor of Illustration (Natural History) in the Faculty of Science and Information Technology places it in an evolutionary ideal, with its roots, firmly bedded in the sciences and its emergence into the age of information technology makes it relevant today as an art form which transcends philosophical boundaries and is the art of nature.

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<sup>1</sup> Alfred I. Tauber, *The Elusive Synthesis: Aesthetics and Science*, Kluwer Academic Publishers, Dordrecht, 1995, p 1.

<sup>2</sup> Root-Bernstein in Alfred I. Tauber, *The Elusive Synthesis: Aesthetics and Science*, Kluwer Academic Publishers, Dordrecht, 1995, p 2.

<sup>3</sup> R. R. Earp, *The Exploration of Colour in Australian Flora and Fauna with Particular Reference to Red*, M Des thesis, University of Newcastle, 2003, p 2.

<sup>4</sup> R. R. Earp, *The Exploration of Colour in Australian Flora and Fauna with Particular Reference to Red*, M Des thesis, University of Newcastle, 2003, p 111.

<sup>5</sup> Penny Olsen, *Feather and Brush; Three Centuries of Australian Bird Art*, CSIRO Publishing, Collingwood, 2001, p 2.

<sup>6</sup> Cedric Flower, , *The Antipodes Observed: Artists of Australia 1788-1850*, Sun Books, Melbourne,

<sup>7</sup> A. A. Llewellyn, *The Art of Communicating Environmental Information*, M Des thesis, University of Newcastle, 2002, p 70 – 71.

<sup>8</sup> S. S. Naumov, *Breaking Tradition: The Changing Face of Wildlife Illustration*, M Des thesis, University of Newcastle, 2001, p 195.

<sup>9</sup> S. S. Naumov, *Breaking Tradition: The Changing Face of Wildlife Illustration*, M Des thesis, University of Newcastle, 2001, p 192.

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