

The Legacy of the International Biological Program in Australia

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Abstract

The International Biological Program (IBP: 1964–1974) was initiated by the International Council of Scientific Unions (now the International Science Council, ISC) to promote the world-wide study of production on land, in freshwaters and in the seas, the potentialities and uses of new and existing natural resources, and human adaptability to changing conditions. The IBP was the first of a series of global initiatives created to promote international collaboration around big environmental science questions since the Second World War. We present a brief review of its international context, and then describe the operations and outcome of the IBP in Australia based largely on the personal experience of Raymond L. Specht (RLS), who was convenor of the Australian PCT section: productivity of terrestrial communities; production processes; and conservation of terrestrial communities. Despite the absence of any dedicated funding for the IBP in Australia, RLS was able to bring a team of interdisciplinary researchers to The University of Queensland and provide them with state-of-the-art research facilities. This was the focus for many national and international exchanges, and several important outcomes. RLS, with the support of the Australian Academy of Science (AAS), enabled the first national survey of the conservation status of plant communities (a target of the IBP for each country) and developed it into an objective assessment long after the IBP itself had ended, laying the foundations for a comprehensive, adequate and representative national reserve system. Much more could have been produced if adequate funding had been provided for the program, reducing the reliance on the commitment and enthusiasm of individual researchers.

Keywords: International Biological Program (IBP), International Science Council (ISC), Australian Academy of Science (AAS), interdisciplinary research, conservation of terrestrial communities

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Introduction

Advances in science depend on sharing ideas. Various means have been employed over the centuries to enable this, from salons to synthesis centres, from exhibitions to conferences (Specht, 2017). Initiatives to support and facilitate global collaboration in the ecological and biological sciences may seem to many as very recent responses to issues like global climate change or biodiversity depletion. Such initiatives have existed, however, for more than one hundred years, with an uneven history not always well understood.

Arguably, the first step in the ‘modern’ phase of research collaboration started in 1899 with the establishment of the International Association of Academies (IAA), of which the Royal Society of London (established in 1660) was a key member. In 1919, the International Research Council (IRC) and the International Union of Biological Societies (IUBS) were established, the latter continuing until the present day. The Australian National Research Council (ANRC) was established in 1921, partly to represent Australia on the IRC (Fenner, 2008). Ten years later the International Council of Scientific

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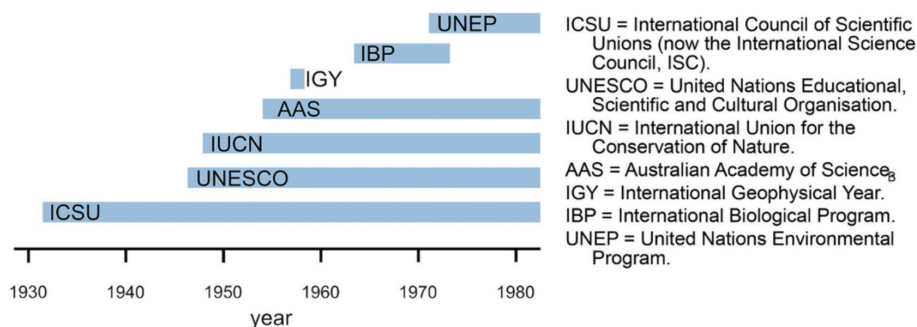
Unions (ICSU) was founded, one of the earliest of the scientific unions (Figure 1), and in 1947, after the interruption of the Second World War, the ICSU established a formal relationship with the newly formed United Nations Educational, Scientific and Cultural Organization (UNESCO), which was closely followed by the International Union for the Conservation of Nature (IUCN) in 1948. The concerns of the time were strongly influenced by effects of the traumas of the Second World War on human populations and resource availability, although conservation of natural resources for their own sake gained some traction. In 1954, the Australian Academy of Science (AAS) was created, and the AAS has subsequently managed, to a large extent, Australia's participation in international scientific initiatives.

In 1951, prior to the creation of the AAS, one of the biggest scientific activities initiated by UNESCO was the Arid Zone Programme, which evolved into the Arid Lands Major Project in 1956 and lasted until 1964 (Heymann, 2020). The focus on arid lands was timely, as concern about drought, desertification and famine in several countries coincided (see Ratcliffe & Huxley, 1947, for an Australian example). Among the outputs of the Arid Zone Programme significant to the present article was a Guide Book for scientists and engineers to produce “integrated surveys” of landscape using appropriate interdisciplinary research methodologies. The Guide Book was edited by Bertram Thomas Dickson of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and was published in 1957 (Dickson, 1957). The Arid Zone Programme paved the way

for a new collaborative, interdisciplinary approach to common challenges, including the causes of climatic change (Heymann, 2020).

The International Geophysical Year (IGY), which spanned 1957–1958, was the main incentive for the creation of the subject of this article, the International Biological Program (IBP). The IGY was sponsored by the ICSU, *inter alia*, to undertake a comprehensive global study of geophysical phenomena and their relationships with solar activity. It was coincident with the scientific and technological advances associated with the USA–USSR ‘space race’, and many countries around the globe participated. The IGY was extremely successful at achieving international collaboration and stimulating outstanding research. As a result, the idea of having a similar initiative for the life sciences soon arose (Worthington, 1965). The presidents of the ICSU (Peters) and IUBS (Montalenti) started to discuss this idea in 1959 as concern was increasing about human population growth and our relationship with natural and managed systems (Rabinowitch & Hasler, 1965; Fenner & Rees, 1980). The IBP was approved by the ICSU in 1963. In 1964, the first IBP Assembly was held in Paris at which its objectives were defined as: to ensure a world-wide study of (a) organic production on the land, in freshwaters and in the seas, and the potentialities and uses of new as well as of existing natural resources; and (b) human adaptability to changing conditions (Worthington, 1965; Frankel, 1966; Fenner, 2008a,b). The IBP was intended to last longer than the IGY because of the disciplinary complexity involved in environmental research (McKee, 1970).

Figure 1. A timeline of selected global initiatives to facilitate global research collaboration, from the establishment of the International Council of Scientific Unions in 1931 until 1980.



The International Council of Scientific Unions (ICSU, now the International Science Council) hosted the IBP International Committee and the Royal Society agreed to provide space for the Special Committee of the IBP (SCIBP) to provide direction for the program. The IBP ran from 1964 until 1974 (Fenner and Rees, 1980; National Academy of Science: [www.nasonline.org/about-nas/history/archives/collections/ibp-1964-1974-1.html#series 1](http://www.nasonline.org/about-nas/history/archives/collections/ibp-1964-1974-1.html#series%201)). Despite general recognition that the work planned for the IBP was urgent, there was little money allocated centrally to the research component, with the exception of the organising committee (Frankel, 1966). This greatly limited participation by many countries, including Australia, each country needing to make independent investments to even support their scientists to participate in meetings. This cut across one of the goals of the IBP, which was to strengthen scientific support for developing nations through international collaboration. The United Kingdom, Czechoslovakia, Poland and Japan provided national funds to the initiative, and eventually scientists participated from Iceland, Denmark, the Netherlands, France, Belgium, Italy, the USSR, Thailand, Australia and New Zealand, using varying sources of funding (Coleman, 2010). In 1967, the United States Congress made a substantial commitment of US\$50 million to the program, with funding directed at the development of a Biome Studies program and most of the funds administered by the National Science Foundation (Mitchell et al., 1976). The Biome Studies program was unprecedented in scope and greatly inspiring internationally. It advanced ecology as a 'proper' quantitative science with systems ecology as the integrator, which disaffected many ecologists who had until then been largely species focused, but heralded the adoption of a holistic approach to ecosystem studies (Kwa, 1987; Coleman, 2010, Chapter 2; Michener, 2015). It has been hailed as the single most important event in the promotion of systems ecology (Kwa, 1987) and provided the focus for subsequent process-based research (Coleman, 2010).

The IBP initiative produced a large body of output, particularly in the USA which to date has been the most studied of the participating countries (e.g. Mitchell et al., 1976; Kwa, 1987; Coleman, 2010; Michener 2015). Twenty-four IBP

Handbooks and 19 Synthesis volumes were produced (Fenner, 1995). The US National Academy of Science holds 7 linear feet of material on the US program alone (<http://www.nasonline.org/about-nas/history/archives/collections/ibp-1964-1974-1.html#series%201>).

IBP Structure

The IBP was organised into seven scientific areas:

1. PT: Productivity of terrestrial communities.
2. PP: Production processes.
3. CT: Conservation of terrestrial communities.
4. PF: Productivity of freshwater communities.
5. PM: Productivity of marine communities.
6. HA: Human adaptability.
7. UM: Use and management of biological resources (Worthington, 1965).

Each of these sections had an international leader, none of whom were from Australia, but Sir Otto Frankel was on the Science Committee of the IBP and in Australia he chaired the National Committee of the IBP, which itself operated under the aegis of the AAS (Frankel, 1966). In 1964, Ray Specht, who was on a Royal Society-Nuffield fellowship at the University of Oxford, on leave from his position at the University of Melbourne, was invited by Prof. G. E. Blackman (of the University of Oxford and Fellow of the Royal Society) to convene a subcommittee of the international PP Section to work on micro-measurements of the gaseous dynamics of the surface atmosphere.

In Australia it was decided that several sections should be combined: sections 1–3 were assigned to Dr R. L. Specht, as Section PCT: productivity, production processes and conservation of terrestrial communities; sections 4 and 5 were assigned to Dr G. F. Humphrey; section 6 to Prof. R. J. Walsh; and section 7 to Dr O. H. Frankel (Specht, 1966; Humphrey, 1966; Frankel, 1966). There was an overall IBP committee, chaired by Prof. Otto Frankel, with four subcommittees, one for each section (Fenner, 1980). There was no national funding available to support the activities, meaning participation in the IBP had to depend on other sources of funds, such as the Australian Research Grants Council (ARGC), universities and CSIRO, which greatly limited Australian participation (Frankel, 1966; Fenner, 1980). The support of Dr Rutherford

Robertson (then biological secretary of the AAS and Fellow of the Royal Society) and Prof. John Stewart Turner (Fellow of the AAS) was central to the success of the PCT program.

This paper presents some of the outcomes and the major integrating concepts that emerged from the Australian IBP initiative, informed by the personal experience of R. L. Specht. We also reflect on the significance to Australian science of the IBP and similar international initiatives.

The PP and PT Sections

Australian scientists and scientific organisations had much to contribute to the IBP objectives in terms of expertise and activity. In the decade after the Second World War, influenced by the pioneering approach of the Arid Zone Programme of UNESCO, CSIRO Land Research began an integrated survey of the ecosystems of tropical and central Australia (Christian et al., 1954), and also in the Territory of Papua and New Guinea. In 1956, the CSIRO and UNESCO held a symposium in Canberra on Climatology and Microclimatology (UNESCO, 1958). The CSIRO Division of Meteorological Physics was strongly promoting the continuous recording of evapotranspiration, photosynthesis and respiration using meteorological masts above smooth-surface plant communities. The prior experience of Ray Specht (hereinafter RLS) both in Australia and overseas had already convinced him of the potential of the integrated work proposed in the IBP, both in the range of ecosystem components being simultaneously studied and the inter-disciplinary nature of the teams required to do the work, so he was primed to take on the task.

RLS first conducted a survey of Australian PT and PP researchers and found that existing research activity was varied and extensive, making organised re-orientation to adhere to the IBP objectives difficult, especially without any additional funding. Fortunately, however, many existing activities could be linked successfully to the program, and the section committees proceeded to identify priorities for research. For PCT, RLS assembled a committee comprising Ralph Slatyer (photosynthesis), Fraser Bergerson (nitrogen cycling), Tom Neales (pasture structure) and David Angus (meteorological physics) to focus on PP, while Peter Attiwill provided input on themes related to PT.

At the instigation of Sir Rutherford Robertson and Sir Fred White (both fellows of the AAS), David Goodall (plant physiology and systems ecology) was brought into the team. At the time, he was at the University of Utah and later became the convener of the Desert Biome program in the USA.

When RLS was appointed to the Chair of Botany at The University of Queensland in 1966, with the IBP goals in mind and with university start-up funding, he established an integrated research laboratory at the university and obtained equipment for a field installation which after much debate was eventually installed at the Archerfield aerodrome near Brisbane. These facilities were among the most sophisticated in Australia at the time, and RLS was able to recruit new staff of the calibre of David Doley (forest eco-physiology), Colin Field (mangrove eco-physiology), Hal Hatch FRS (of the 'Hatch and Slack' photosynthetic pathway), David Lamb (forest ecology and nutrient cycling), Rod Rogers (lichens and ecology), Ted and Margaret Van Steveninck (plant cellular physiology), Walt Westman (ecology) and David Yates (climate relations in plant communities, *inter alia*). This team and the facilities attracted many international visitors to Brisbane, such as Champ Tanner, Phil Miller, Richard Staff and Peter Day (USA), Bob van den Driessche, Bruce Bohm and Neil Trivett (Canada), Ruhamer Berliner (Israel), Eugene Moll and Fred Kruger (South Africa), Suichi Iwahori (Japan), Margarita Arianoutsou (Greece), Carlos Gracia (Spain), and Arthur Clapham, Chris Page and Tristan Dyer (UK), alongside Australian researchers such as Bill Williams, Fellow of the AAS, who inspired many of the methods used in the CT program, and Catherine Mittelheuser, independent researcher.

A key output of the PP and PT sections was the unique research conducted by Westman and Rogers on North Stradbroke Island, which remains a vitally important piece in quantifying carbon sequestration and nutrient cycling on low-nutrient, freely draining substrates (Westman, 1975, 1978; Rogers & Westman, 1977, 1981; Westman & Rogers, 1977a,b). The work that was stimulated by the PP and PT sections of the IBP in Brisbane and elsewhere in Australia provided a strong legacy that was brought together in the book *Australian Plant Communities: Dynamics of Structure, Growth and Biodiversity* (Specht & Specht, 1999, 2002).

In 1967 when the IBP in the United States received its large grant from the NSF, it also merged its PP, PT and CT sections, and created the Biome Studies program. The Californian sub-committee promoted the Mediterranean Biome Study, firstly between California and Chile, and then worldwide as the MEDECOS (Mediterranean Ecosystem) research study, which held its first meeting in 1971. RLS was closely involved with MEDECOS due to his pre-eminent expertise in heathland ecosystems. Conferences were held biennially, and in 1988 Gideon Orshan (Israel) and RLS (Australia) integrated these studies in *Mediterranean-type Ecosystems: A Data Source Book* (Specht, 1988).

These activities helped RLS to identify a number of basic integrating concepts of community-physiology that guided him in the following decades:

- The conservation of soil moisture.
- The impacts of salt and calcareous dust exposure.
- The survival of heathy vegetation on nutrient-poor soils.
- Soil nitrate production in canopy gaps.
- The alpha and gamma dimensions of biodiversity.
- The relationship between productivity and biodiversity over space and time.

The CT Section

The CT Section was led internationally by Mr Max Nicholson, the eminent conservationist (amongst other achievements, he was a co-founder of the World Wildlife Fund and IUCN). He visited Australia in 1964 to discuss the concept and the plan for each country to collate lists of plant 'communities' for global assessment following a standard procedure, and these would be collated at the Monks Wood Experimental Station in the UK (Robertson, 1974; Clapham, 1980). Subsequently, RLS outlined his proposal for IBP activity in Australia across the PP, PT and CT sections (Specht, 1966). CT became one of the strongest Australian sections, building most successfully on existing capacity and expertise. The Australian Academy of Science established a committee for each state and territory of Australia, including Papua and New Guinea, with support in each jurisdiction. Although the conservation status

of fauna was also within the program's scope, it was impossible to pursue this with the lack of funding at the time. It was therefore decided that the focus should be on plant communities, with the knowledge that if a satisfactory plant conservation network could be achieved, most fauna would be protected too (Specht et al., 1974). Migratory animals would require special conservation measures.

The first task was to classify the plant communities in a robust and transparent manner. The international classification of plant communities developed for the IBP (the Fosberg scheme, Peterken, 1967) was found to be unsuitable for Australian conditions, so a new classification based on life form, horizontal cover and height was adopted (Specht, 1970). For many years this was colloquially known as the 'Specht structural formation'. This classification scheme was modified and improved over time (see for example Table 3.2, Specht & Specht, 2002). The novel measurement Foliage Projective Cover, which is an objective point-intercept method, provided a key component of the structural classification (Specht, 1972) and continues to be used in vegetation assessment today, both on-ground and remotely (e.g. Guerin et al., 2017; Fisher et al., 2018).

The largely unfunded efforts of RLS, Ethel Roe and Valerie Boughton (all at The University of Queensland), of each member of the state committees, and of Geoff Mosely of the newly formed (1965) Australian Conservation Foundation, who verified the conservation status of the identified communities, resulted in the publication in 1974 of the Specht Report as a special supplement of the *Australian Journal of Botany* (Specht et al., 1974). This effort broke new ground and provided the basis for the effective conservation of Australian ecosystems (Fenner, 1975).

There were some scientific limitations in the methods used to produce the 1974 report. First, it was recognised that there was little coordination of plant ecological surveys across the continent, resulting in markedly different degrees of resolution and standardisation for comparative purposes. Secondly, the work depended on a committee-based delineation of plant communities, which could result in biased outcomes. Therefore, in the light of greatly enhanced computing capacity in the 1970s and early 1980s, and the sophisticated

classification programs available, RLS determined that the assessment should be repeated, this time using objective methods. With funding from the National Estates Grants Programme (1980–1982), the Australian Biological Resources Study (1980) and a University of Queensland Research Grant (1980–1985) he undertook to:

- (i) collate and harmonise all the existing vegetation survey data across Australia;
- (ii) convert paper to digital records using the new sophisticated computer systems;
- (iii) use the new non-parametric analyses available through CSIRONET^a to define broad plant formation/vegetation complexes; and
- (iv) assess their conservation adequacy.

As described more fully in Specht et al. (1995), 711 ecological surveys incorporating 4088 floristic lists across the continent of Australia were assembled into structural formations and the data entered into the PDP10 computer at The University of Queensland. These large databases were analysed by the polythetic-divisive classificatory program TWINSPAN (Hill et al., 1975; Hill, 1979) on CSIRONET. A total of 343 TWINSPAN Floristic Groups/Subgroups (including 60 understorey subgroups) was defined for the whole continent. A key for identification of each floristic group was created, and using these keys, experts for each community and in each state (often the same people involved in the 1974 assessment) were able to validate the results, and modifications could be made. The floristic groups were then spatially represented and biogeographic regions determined using the classificatory program PATN (Belbin, 1994). The conservation status of each floristic group was assessed using the following criteria:

- (i) Is it conserved in a reserve?
- (ii) If so, how many reserves and what is the area of each?
- (iii) What is the community diversity of each reserve?
- (iv) In how many Biogeographic Regions does it occur?

From this it was determined that only 36% of the plant communities in Australia were adequately conserved (Specht et al., 1995).

Separately, a methodology established through the IBP for the determination of conservation areas was applied by Bolton & Specht (1983) and later adapted by Purdie (1987) for the systematic selection of conservation reserves in Australia.

The legacy of the CT work has been further enabled through the advancement of computing capacity in the 21st century, the creation of TRUST-ed repositories (Lin et al., 2020), the world of FAIR (Findable, Accessible, Interoperable and Reproducible; Wilkinson et al., 2016), and open data. In 2018, after a process of data recovery of the digitised records originally collected for the objective assessment (Specht et al., 1995), much of the data so painstakingly assembled was harmonised, the nomenclature and georeferencing brought up to date, and then deposited in open-access, curated repositories (Specht et al., 2018a,b; *Atlas of Living Australia*, <https://collections.ala.org.au/public/show/dr8212>).

What Came After the IBP?

At an international scale, the IBP was followed by other initiatives, some of which continue to this day (Figure 2). The establishment of the United Nations Environmental Program (UNEP) in 1972 signalled an increasing recognition of the need for a greater focus on environmental matters among governments, and by the 1980s global environmental change, in particular climate change, was increasingly to the fore, and the International Geosphere-Biosphere Programme (IGBP: 1987–2015) was established by the ICSU to “coordinate international research on global-scale and regional-scale interactions between Earth’s biological, chemical and physical processes and their interactions with human systems”. The IGBP approach was to integrate the Earth’s natural physical, chemical and biological cycles and processes and the social and economic dimensions (Kwa, 2005). Although the design incorporated the ecological sciences, its focus on the earth sciences was dominant, not aided by a disjunction in the

^a An Australia-wide computing network offered by CSIRO (initially through the CSIRO Division of Computing Research) to its staff, government departments, tertiary institutions and private companies between 1970 and approximately 1993 (<https://csiropedia.csiro.au/category/history/>).

ecological research community which was split between the evolutionary and population ecologists and the systems ecologists, a state of affairs exacerbated by the results of the IBP (Kwa, 1987; Kwa, 2005).

With a feeling that biodiversity was not being well served in the IGBP, the DIVERSITAS program (<https://www.diversitas-international.org/>) was established (with sponsorship from UNESCO and the IUBS), to develop an international, non-governmental umbrella program for research projects focusing on:

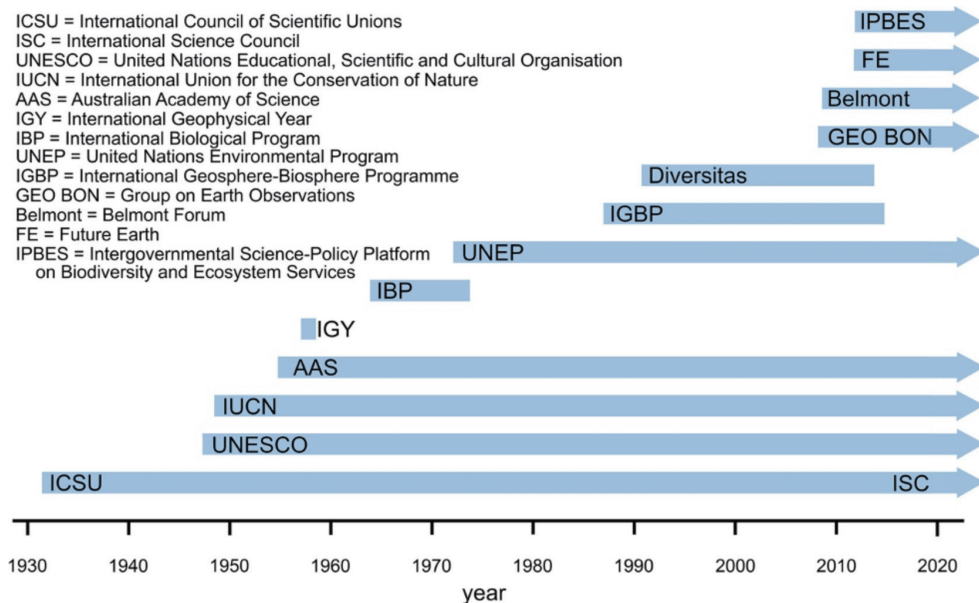
- (a) the effects of biodiversity on ecosystem functioning;
- (b) the origins, maintenance and loss of biodiversity; and
- (c) the systematics, inventory and classification of biodiversity.

This ceased operation in 2014, but not before the Biodiversity Observation Network (GEO BON), a component of the Group on Earth Observations (GEO) with over 70 member countries, was established. The role of GEO BON, consistent with the Convention on Biological Diversity (1992: <https://www.cbd.int/convention/>), is to collect time series

observations of biota and to conduct change assessment in genetics, species and ecosystems, with a specific eye on ecosystem services. The measurement of Essential Biodiversity Variables (Pereira et al., 2013) to enable better detection of important aspects of change is a core component of GEO BON.

In 2009, the Belmont Forum was established, a partnership of funding organisations, international science councils and regional consortia committed to facilitate “international transdisciplinary research providing knowledge for understanding, mitigating and adapting to global environmental change” (<https://www.belmontforum.org>). A little later, in 2010, a proposal was accepted in response to the findings of the Intergovernmental Panel on Climate Change (IPCC) to establish a science-policy platform on biodiversity and ecosystem services. This resulted, in 2012, in the creation of IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) whose aim is to strengthen the science-policy interface for the conservation and sustainable use of biodiversity, long-term human wellbeing and sustainable development (<https://ipbes.net/>). It is an independent body under the aegis of UNEP.

Figure 2. A timeline of selected global initiatives to facilitate global collaboration, from the establishment of the International Council of Scientific Unions in 1931 until the time of publication of this article, 2020.



In 2012, the IGBP and DIVERSITAS (<https://www.diversitas-international.org/>), alongside the International Human Dimension Programme, were forged into one new organisation, Future Earth (<https://futureearth.org/>), under the governorship of the Belmont Forum, UNESCO, UNEP, ISC, the World Meteorological Organisation and the Science and Technology in Society (STS) Forum. The mission of Future Earth is to “accelerate transformations in global sustainability through research and innovation, focusing on systems-based approaches to improve understanding”, which it effects through funding global research projects and various networking initiatives.

Conclusion

This brief, non-exhaustive history of international collaboration in the environmental and biodiversity sciences built around the formation of the IBP illustrates that interdisciplinary international collaboration has long been recognised as fundamental to addressing big ecosystem science questions. Sharing knowledge, technology and expertise is essential for human wellbeing, as well as for conserving and managing our natural resources. Most of the environmental problems and scientific challenges we have faced since the IBP have required considerable international cooperation, which scientists usually initiate individually as far as they are able, as that is their training. At individual level this has, however, always been a struggle. Giving all scientists the opportunity to build meaningful partnerships with their peers and mentors around the world puts Australia on the map, as well as raising the capability of Australian scientists. It is not only bringing new ideas and practices to Australia, it is confirming and communicating Australian excellence as well.

The IBP experience through the PCT program tells us a great deal about the benefits of international scientific collaboration both to individual researchers and to the practice of science. The PCT program, steered by the AAS, was a collaborative

exercise at all levels, in particular for the achievement of the CT outcomes. The creation of a new group of high-level scientists supported to conduct top-level science in Queensland – arguably the first time such a concentration of effort had occurred in the state – was greatly stimulated by the existence of the IBP and attracted scientific expertise from around the world, further fertilising the activity. This benefited the training of students, who went on to engage at a higher level than they may have otherwise. It also greatly enhanced The University of Queensland’s reputation in the ecosystem and biodiversity sciences internationally.

Australia has been represented on most of the international organisations mentioned in this paper, although not always as a full participant. In many instances the AAS has been the link. Often, Australian representation has been through CSIRO staff. But have these initiatives had wide benefit throughout the research community? Frankel (1966), Fenner & Rees (1995) and Fenner (1995, 2008) repeatedly emphasised that to get full benefit from such initiatives, realistic funding needs to be made available. The outcomes of the Australian PCT section of the IBP would arguably have been much greater if it had not had to rely so very much on voluntary labour and the personal commitment of the scientists involved.

It is comforting to see that one of the main ‘new technologies’ of the IBP, the systems-based approach, has returned to favour in Future Earth. Equally well, it is encouraging to see that the interdisciplinary and collaborative nature of research proposed by the Arid Zone Research Programme in the early fifties is increasingly being recognised and extended to trans-disciplinary considerations. This brief history shows that environmental and biodiversity science is now regarded as a primary endeavour. One hopes that each new initiative learns from the previous, and that the long-term roles of organisations like the ISC, AAS, UNEP and UNESCO have strong reflective components.

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The *Conservation Atlas of Plant Communities in Australia* (Specht et al., 1995) was launched at Southern Cross University, Lismore, in September that year by Ms Patricia Caswell, the Executive Director of the Australian Conservation Foundation. Pictured at the launch are Elwyn Hegarty and Michael Whelan (back) and Ray Specht, Patricia Caswell and Alison Specht (front).

Author Profiles

Dr Alison Specht has been involved with the IBP project for a long time. As a high school student she spent some holidays entering punch cards into the CSIRONET computer system; while a PhD student at The University of Queensland she entered coded species lists and metadata into the LAN; as a postdoc she ran the project analyses when M. P. Bolton joined the weeds research station in Charters Towers; as an academic at Southern Cross University she was responsible for turning keys into maps for the 1995 *Conservation Atlas*; and most recently she oversaw the capture of data for delivery to open repositories.

Emeritus Prof. Raymond Specht, AO, a member of the Royal Society of Queensland since 1957 and appointed a Life Member in 2015, is an eminent Australian botanist and ecologist. His career accelerated when he was appointed as botanist to the American-Australian Scientific Expedition to Arnhem Land in 1947. This expedition, finally undertaken in 1948, informed much of his later career. He was Professor of Botany at The University of Queensland from 1966 until his retirement in 1989, at which time he was granted emeritus status at the University. He holds a PhD (1953) and DSc (1975) from the University of Adelaide.