

Recent Advances in Science in Western Australia



Earth Sciences

Anand RR, Phang C, Wildman JE & Lintern MJ 1997 Genesis of some calcretes in the Southern Yilgarn Craton, Western Australia - implications for mineral exploration. *Australian Journal of Earth Sciences* 44:87-103.

A model for the genesis of pedogenic calcretes is developed by researchers from the CRC for Landscape Evolution and Mineral Exploration (CSIRO, Wembley), based on study of the Mt Gibson and Kalgoorlie regions. At Mt Gibson, calcrete is largely restricted to erosional regimes on greenstones and is absent or rare in relict and depositional regimes; in granitic terrain calcrete is absent in relict and erosional regimes but is present in minor amounts in depositional regimes. By contrast, it is present in all geomorphic regimes in the Kalgoorlie region although it is more abundant in erosional regimes on mafic bedrock. Ca and Mg in calcretes comes from *in situ* weathering, the dominant source in erosional regimes, and external sources, which have a larger input in depositional regimes. The differences in distribution of calcrete in relict and depositional regimes in the two study regions may be attributed to different conditions of weathering and landscape development.

Arne D 1996 Thermal setting of the Cadjebut Zn-Pb deposit, Western Australia. *Journal of Geochemical Exploration* 57:45-56.

Bau M, Hohndorf A, Dulski P & Beukes NJ 1997 S of rare-earth elements and iron in paleoproterozoic iron-formations from the Transvaal supergroup, South Africa - evidence from neodymium isotopes. *Journal of Geology* 105:121-129.

Boschetti F, Dentith MC & List RD 1996 Inversion of seismic refraction data using genetic algorithms. *Geophysics* 61:1715-1727.

Dickins JM 1996 Problems of a Late Palaeozoic glaciation in Australia and subsequent climate in the Permian. *Palaeogeography Palaeoclimatology Palaeoecology* 125:185-197.

Frey FA, McNaughton NJ, Nelson DR, De Laeter JR & Duncan R 1996. Petrogenesis of the Bunbury Basalt, Western Australia: interaction between the Kerguelen plume and Gondwana lithosphere. *Earth & Planetary Science Letters* 144:163-183.

Researchers from MIT, the University of Western Australia, Geological Survey of Western Australia, Curtin University and Oregon State University have collaborated to describe how subsequent to initial rifting of Greater India from Australia/Antarctica at *ca* 132 Ma, widespread Early Cretaceous volcanism occurred on the continental margins *e.g.* the *ca* 117 Ma Rajmahal Traps in northeast India and the *ca* 130-123 Ma Bunbury Basalt in the Perth Basin. The Bunbury Basalt can be divided into the 130 Ma Casuarina lavas and the 123 Ma Gosselin lavas. Sr and Nd isotopic ratios in Casuarina lavas are similar to those in younger lavas from the Ninetyeast Ridge and Kerguelen Archipelago which define the Kerguelen hotspot

track. Although the Bunbury Basalt may be a response to long-term incubation of the plume beneath eastern Gondwana, the eruption ages (130 and 123 Ma) are significantly older than the oldest measured ages (115-110 Ma) for the large igneous province (Kerguelen Plateau) associated with the plume when Western Australia was apparently ~1000 km from the plume. Hence the Bunbury Basalt may be unrelated to the plume and the geochemical similarities of Casuarina and younger plume-related lavas may be fortuitous.

Gray DJ, Schorin KH & Butt CRM 1996 Mineral associations of platinum and palladium in lateritic regolith, Ora Banda Sill, Western Australia. *Journal of Geochemical Exploration* 57:245-255.

Hamilton NTM & Collins LB 1997 Morphostratigraphy and evolution of a Holocene composite barrier at Minninup, southwestern Australia. *Australian Journal of Earth Sciences* 44:113-124.

The composite transgressive-regressive barrier system at Minninup differs substantially in morphology, stratigraphy and evolution from published barrier models. The Minninup barrier is characterised geomorphically by isolated back-barrier flats and channels, a broad, transgressive dune field, narrow foredune, reflective beach, and narrow and shallow nearshore zone. Stratigraphically, the mid- to late Holocene sandy barrier sediments are perched on top of muddy back-barrier facies. Mid-Holocene sea-level rise to approximately +3 m above present sea-level initiated development of raised beach and nearshore units. Heavy-mineral concentration has taken place throughout the development of the barrier and is preserved in all units.

Hubbard RNLB & Boulter MC 1997 Mid Mesozoic floras and climates. *Palaeontology* 40:43-70.

Johannesson KH, Lyons WB, Yelken MA, Gaudette HE & Stetzenbach KJ 1996 Geochemistry of the rare-earth elements in hypersaline and dilute acidic natural terrestrial waters - complexation behavior and middle rare-earth element enrichments. *Chemical Geology* 133:125-144.

Kang HJ & Fenical W 1997 Aplidiamine, a unique zwitterionic benzyl hydroxyadenine from the Western Australian marine ascidian *Aplidiopsis* sp. *Tetrahedron Letters* 38:941-944.

Kang HJ & Fenical W 1997 Ningalins a-d - novel aromatic alkaloids from a Western Australian ascidian of the genus *Didemnum*. *Journal of Organic Chemistry* 62:3254-3262.

Kent AJR & McDougall I 1996 Ar-40/Ar-39 and U-Pb age constraints on the timing of gold mineralization in the Kalgoorlie gold field, Western Australia - a reply. *Economic Geology & the Bulletin of the Society of Economic Geologists* 91:795-799.

Knight JT, Ridley JR, Groves DI & McCall C 1996 Syn-peak metamorphic gold mineralization in the amphibolite-facies, gabbro-hosted Three Mile Hill deposit, Coolgardie goldfield, Western Australia - a high-temperature analogue

of mesothermal gabbro-hosted gold deposits. Transactions of the Institution of Mining & Metallurgy Section B-Applied Earth Science 105:B175-B199.

- Lintern MJ, Butt CRM & Scott KM 1997** Gold in vegetation and soil - three case studies from the goldfields of southern Western Australia. *Journal of Geochemical Exploration* 58:1-14.
- Mazzucchelli RH 1996** The application of soil geochemistry to gold exploration in the Black Flag Area, Yilgarn Block, Western Australia. *Journal of Geochemical Exploration* 57:175-185.
- Mishra HK 1996** Comparative petrological analysis between the Permian coals of India and Western Australia - paleoenvironments and thermal history. *Palaeogeography Palaeoclimatology Palaeoecology* 125:199-216.
- Mueller AG, Campbell IH, Schiotte L, Sevigny JH & Layer PW 1996** Constraints on the age of granitoid emplacement, metamorphism, gold mineralization, and subsequent cooling of the Archean greenstone terrane at Big Bell, Western Australia. *Economic Geology & the Bulletin of the Society of Economic Geologists* 91:896-915.
- Naldrett AJ 1997** Key factors in the genesis of Norilsk, Sudbury, Jinchuan, Voiseys Bay and other world-class Ni-Cu-pge deposits - implications for exploration. *Australian Journal of Earth Sciences* 44:283-315.
- Nemchin AA & Pidgeon RT 1997** Evolution of the Darling Range batholith, Yilgarn Craton, Western Australia - a SHRIMP zircon study. *Journal of Petrology* 38:625-649.
- Oliver NHS & Barr TD 1997** The geometry and evolution of magma pathways through migmatites of the Halls Creek Orogen, Western Australia. *Mineralogical Magazine* 61:3-14.
- Phillips GN, Groves DI & Kerrich R 1996** Factors in the formation of the giant Kalgoorlie gold deposit. *Ore Geology Reviews* 10:295-317.
- Researchers from Great Central Mines (Melbourne), the University of Western Australia, and the University of Saskatchewan, describe how Kalgoorlie (Golden Mile and Mt Charlotte) accounts for more than half of the gold obtained from the widespread gold mineralisation of the Archaean Yilgarn Craton and is one of the largest gold deposits in the world (>1800 t Au production and reserves). This giant gold deposit owes its size and unique position to a number of features of favourable host-rock composition, thickness and mechanical properties, favourable geometry of its host units and hosting greenstone belts at favourable PT conditions in the greenschist facies that together with proximity to the regional scale Boulder-Lefroy Fault allowed highly focused fluid flow on both a deposit and district scale.
- Rajesh HM, Santosh M & Yoshida M 1996** The felsic magmatic province in East Gondwana - implications for pan-African tectonics [Review]. *Journal of Southeast Asian Earth Sciences* 14:275-291.
- Reason CJC 1996** Topography and the dynamical response to easterly flow in southern hemisphere subtropical west coast regions. *Meteorology & Atmospheric Physics* 61:187-199.
- Robertson IDM 1996** Ferruginous lag geochemistry on the Yilgarn Craton of Western Australia - practical aspects and limitations. *Journal of Geochemical Exploration* 57:139-151.
- Robinson BH, Chiarucci A, Brooks RR, Petit D, Kirkman JH, Gregg PEH & Dedominicis V 1997** The nickel hyperaccumulator plant *Alyssum bertolonii* as a potential agent for phytoremediation and phytomining of nickel. *Journal of Geochemical Exploration* 59:75-86.
- Seaman RS 1997** A comparison of some methods for reduction of pressure to sea level over Australia. *Australian Meteorological Magazine* 46:15-25.
- Seddon G 1996** Thinking like a geologist: the culture of geology. Mawson Lecture 1996. *Australian Journal of Earth Sciences* 43:487-495.
- Geology is described by G Seddon of the Centre for studies in Australian Literature (the University of Western Australia) as having a crucial role in both the scientific and popular culture. His conclusions regarding the nature of geology include: (i) there is no hierarchy of the sciences; (ii) geology is a Romantic science rather than a Classical one; (iii) there is no such thing as the scientific method; (iv) geologists often attempt to reconcile conflicting hypotheses; (v) geological phenomena are often of an almost irreducible complexity and their investigation is beset by problems of scale, both spatial and temporal; and (vi) the concept of universality has a distinctive application in geology. Among the non-professional uses of geology are: (i) human history is incomplete without environmental history; (ii) geology has application in environmental planning and management; and (iii) awareness of the geology of a region enhances the sense of place.
- Seitz HM & Keays RR 1997** Platinum group element segregation and mineralization in a noritic ring complex formed from proterozoic siliceous high magnesium basalt magmas in the Vestfold Hills, Antarctica. *Journal of Petrology* 38:703-725.
- Semeniuk V 1996** Coastal forms and Quaternary processes along the arid Pilbara coast of northwestern Australia. *Palaeogeography, Palaeoclimatology, Palaeoecology* 123:49-84.
- Coastal landforms along the arid Pilbara coast formed during the Quaternary through the influence of ancestral landforms and fluvial and shoreline accretion, coastal erosion, and cementation. Climate also played a significant role with high evaporation rates coupled with limited rainfall, cyclonic storms and limited sediment delivery to the coastal zone. As a result, this arid coast is characterised by a range of features such as construction of arid-zone deltas, delta destruction and sediment redistribution during times of sediment depletion, cyclone-induced erosion and sedimentation, mangrove deposits, formation of salt flats, and precipitation and cementation to form beachrocks, high tidal crusts and gypsum precipitates.
- Simonson BM & Hassler SW 1997** Revised correlations in the Early Precambrian Hamersley Basin based on a horizon of resedimented impact spherules. *Australian Journal of Earth Sciences* 44:37-48.
- Siverson M 1996** Lamniform sharks of the mid Cretaceous Alinga Formation and Beedagong claystone, Western Australia. *Palaeontology* 39:813-849.
- Smith RE 1996** Regolith research in support of mineral exploration in Australia. *Journal of Geochemical Exploration* 57:159-173.
- Sugitani K, Horiuchi Y, Adachi M & Sugisaki R 1996** Anomalously low Al₂³⁺/TiO₂ values for Archean cherts from the Pilbara Block, Western Australia - possible

evidence for extensive chemical weathering on the early earth. *Precambrian Research* 80:49-76.

Sundaralingam K 1997 Shear velocity structure beneath the Western Australian region. *Australian Journal of Earth Sciences* 44:69-75.

Sylvester P, Campbell IH & Bowyer DA 1997 Niobium/uranium evidence for early formation of the continental crust. *Science* 275:521-523.

Tompkins LA, Groves DI, Windrim DP, Jablonski W & Griffin WL 1997 Petrology, mineral chemistry, and exploration significance of Fe-sulfides from the metal dispersion halo surrounding the Cadjebut Zn-Pb mvt deposit, Western Australia. *Applied Geochemistry* 12:37.

Vanemden B, Thornber MR, Graham J & Lincoln FJ 1997 The incorporation of actinides in monazite and xenotime from Placer deposits in Western Australia. *Canadian Mineralogist* 35:95-104.

Vincent P 1996 Rillenkarren in the British Isles. *Zeitschrift fur Geomorphologie* 40:487-497.

Williams GE 1997 Precambrian length of day and the validity of tidal rhythmite paleotidal values. *Geophysical Research Letters* 24:421-424.

Wilson TJ, Grunow AM & Hanson RE 1997 Gondwana assembly - the view from southern Africa and east Gondwana. *Journal of Geodynamics* 23:263-286.

Witt WK, Swager CP & Nelson DR 1996 Ar-40/Ar-39 and U-Pb age constraints on the timing of gold mineralization in the Kalgoorlie gold field, Western Australia - a discussion. *Economic Geology & the Bulletin of the Society of Economic Geologists* 91:792-795.

Woodhead JD & Hergt JM 1997 Application of the double spike technique to Pb-isotope geochronology. *Chemical Geology* 138:311-321.

Yeats CJ, McNaughton NJ & Groves DI 1996 Shrimp U-Pb geochronological constraints on Archean volcanic-hosted massive sulfide and lode gold mineralization at Mount Gibson, Yilgarn Craton, Western Australia. *Economic Geology & the Bulletin of the Society of Economic Geologists* 91:1354-1371.

Zhou HW 1996 A high-resolution p wave model for the top 1200 km of the mantle. *Journal of Geophysical Research-Solid Earth* 101(B12):27791-27810.

Life Sciences

Abensperg-Traun M, Arnold GW, Steven DE, Smith GT, Atkins L, Viveen JJ & Gutter M 1996 Biodiversity indicators in semi-arid, agricultural Western Australia. *Pacific Conservation Biology* 2:375-389.

A cooperative study by researchers from CSIRO Division of Wildlife Ecology (Midland) and the Agricultural University, Wageningen (Netherlands), investigated biodiversity indicators in semi-arid, agricultural Western Australia. Remnant area, vegetational structural diversity, species richness of plants, lizards and terrestrial arthropods, and the relative abundance of arthropod species were examined as indicators of faunal richness in two contrasting vegetation types, gimlet woodland and shrublands. No indicator variables effectively predicted total faunal richness for either vegetation type, but vegetation structural diversity and plant richness explained a

high percentage of variation in the richness of lizards, scorpions, termites and beetles in woodlands. The richness of the shrubland fauna was poorly predicted by all indicator variables. Differences in the predictive values of vegetation structure and plant richness between the two vegetation types was partly due to the spatial heterogeneity of biotic richness, and perhaps the scale of structure measurements.

Abensperg-Traun M, Steven D & Atkins L 1996 The influence of plant diversity on the resilience of harvester termites to fire. *Pacific Conservation Biology* 2:279-285.

Researchers from CSIRO Division of Wildlife Ecology (Midland) describe how the harvester termites of floristically-rich mallee-heath of southern Western Australia appear to be resilient to high-intensity fire, in contrast with harvesters in floristically-simple, intensely-burnt spinifex grassland of tropical Western Australia. It appears that high floristic diversity enhances the resilience of harvester termites to fire. Although the death of spinifex and associated harvester termites after fire may be atypical, the temporary local extinction of harvester termites might not be exceptional, particularly if the fire occurs with drought or high grazing pressure.

Agboma PC, Jones MGK, Peltonensainio P, Rita H & Pehu E 1997 Exogenous glycinebetaine enhances grain yield of maize, sorghum and wheat grown under two supplementary watering regimes. *Journal of Agronomy & Crop Science-Zeitschrift fur Acker und Pflanzenbau* 178:29-37.

Akilan K, Marshall JK, Morgan AL, Farrell RCC & Bell DT 1997 Restoration of catchment water balance - responses of clonal river red gum (*Eucalyptus camaldulensis*) to waterlogging. *Restoration Ecology* 5:101-108.

Amaoka K, Arai M & Gomon MF 1997 A new species of *Arnoglossus* (Pleuronectiformes, Bothidae) from the southwestern coast of Australia. *Ichthyological Research* 44:131-136.

Anderson PK 1997 Shark Bay dugongs in summer. 1. Lek mating. *Behaviour* 134:433-462.

Bailey MC & Hamilton DP 1997 Wind induced sediment resuspension - a lake-wide model. *Ecological Modelling* 99:217-228.

Bray RA & Cribb TH 1997 Lepocreadiid (Digenea) species from members of the marine teleost family Cheilodactylidae from south-western Australia, including four new genera and five new species. *Systematic Parasitology* 37:27-45.

Carnegie AJ, Keane PJ & Podger FD 1997 The impact of three species of *Mycosphaerella* newly recorded on eucalyptus in western australia. *Australasian Plant Pathology* 26:71-77.

Chapman A & Lane JAK 1997 Waterfowl usage of wetlands in the south-east arid interior of Western Australia 1992-93. *Emu* 97:51-59.

Cheeseman JM, Herendeen LB, Cheeseman AT & Clough BF 1997 Photosynthesis and photoprotection in mangroves under field conditions. *Plant Cell & Environment* 20:579-588.

Dawson TJ & Ellis BA 1996 Diets of mammalian herbivores in Australian arid, hilly shrublands: seasonal effects on overlap between euros (hill kangaroos), sheep and feral goats, and on dietary niche breadths and electivities. *Journal of Arid Environments* 34:491-506.

Two researchers from the University of New South Wales describe the results of a 12 year study on the diets of euros (*Macropus robustus*), domestic sheep (*Ovis aries*) and feral goats (*Capra hircus*) in hilly shrubland of southern Australia. The diet of euros was based around grasses whereas grasses were important in the diet of sheep in wetter conditions but shrubs were important in the dry season. Feral goats had a broad diet, but a high preference for browse. Dietary niche breadths and electivities indicate only limited competition between the euros, sheep and goats.

- Eldridge MDB & Pearson DJ.** 1997 Chromosomal rearrangements in rock wallabies, *Petrogale* (Marsupialia, Macropodidae). 9. Further g-banding studies of the *Petrogale lateralis* complex - *P. lateralis pearsoni*, the west Kimberley race, and a population heterozygous for a centric fusion. *Genome* 40:84-90.
- Field LH & Bailey WJ** 1997 Sound production in primitive Orthoptera from Western Australia: sounds used in defence and social communication in *Ametrus* sp. and *Hadrogryllus* sp. (Gryllacrididae: Orthoptera). *Journal of Natural History* 31:1127-1141.
- Researchers from the University of Canterbury (New Zealand) and the University of Western Australia have collaborated to describe sound production in two undescribed Western Australian orthopteran insects (Gryllacrididae). Sound is used for both defence, produced by femoro-tergal stridulation, and intra-specific signalling by drumming on the substrate. The evolution of these calling behaviours is discussed with reference to the other primitive ensiferan family (Stenopelmayidae) known to produce both tergo-sternal defensive stridulation and femoral drumming.
- Kang HJ & Fenical W** 1997 Aplidiamine, a unique zwitterionic benzyl hydroxyadenine from the Western Australian marine ascidian *Aplidiopsis* sp. *Tetrahedron Letters* 38:941-944.
- Kang HJ & Fenical W** 1997 Ningalins a-d - novel aromatic alkaloids from a Western Australian ascidian of the genus *Didemnum*. *Journal of Organic Chemistry* 62:3254-3262.
- Loi A, Cocks PS, Howieson JG & Carr SJ** 1997 Morphological characterization of mediterranean populations of *Biserrula pelecinus* L. *Plant Breeding* 116:171-176.
- Newell GR** 1997 The abundance of ground-dwelling invertebrates in a Victorian forest affected by dieback (*Phytophthora cinnamomi*) disease. *Australian Journal of Ecology* 22:206-217.
- Parsons KE** 1997 Role of dispersal ability in the phenotypic differentiation and plasticity of two marine gastropods. 1. shape. *Oecologia* 110:461-471.
- Postmaster A, Sivasithamparam K & Turner DW** 1997 Enumeration and identity of microorganisms isolated from the surface of banana fruits at three developmental stages. *Scientia Horticulturae* 69:189-197.
- Rahman MH & Hossain I Moslehuddin** 1997 Nutritional evaluation of sweet lupin (*Lupinus angustifolius*) - net protein utilization (npu), nitrogen balance and fractionation studies. *British Journal of Nutrition* 77:443-457.
- Regan KL, Siddique KHM, Tennant D & Abrecht DG** 1997 Grain yield and water use efficiency of early maturing wheat in low rainfall mediterranean environments. *Australian Journal of Agricultural Research* 48:595-603.
- Robinson BH, Chiarucci A, Brooks RR, Petit D, Kirkman JH, Gregg PEH & Dedominicis V** 1997 The nickel hyperaccumulator plant *Alyssum bertolonii* as a potential agent for phytoremediation and phytomining of nickel. *Journal of Geochemical Exploration* 59:75-86.
- Siverson M** 1996 Lamniform sharks of the mid Cretaceous Alinga Formation and Beedagong claystone, Western Australia. *Palaeontology* 39:813-849.
- Smolker R, Richards A, Connor R, Mann J & Berggren P** 1997 Sponge carrying by dolphins (*Delphinidae*, *Tursiops* sp.) - a foraging specialization involving tool use. *Ethology* 103:454-465.
- Speers DJ & Jelfs J** 1997 Typing of *Neisseria meningitidis* by restriction analysis of the amplified pora gene. *Pathology* 29:201-205.
- Steinborner ST, Wabnitz PA, Waugh RJ, Bowie JH, Gao CW, Tyler MJ & Wallace JC** 1996 The structures of new peptides from the Australian red tree frog *Litoria rubella* - the skin peptide profile as a probe for the study of evolutionary trends of amphibians. *Australian Journal of Chemistry* 49:955-963.
- The Zoological Catalogue of Australia. Volume 28.** Strepsiptera (TR New), Mecoptera (KJ Lambkin), Neuroptera (TR New), Siphonaptera (AA Calder). The Australian Biological Resources Study, Canberra. CSIRO Publishing, Melbourne.
- Volume 28 of the outstanding monograph series by the Australian Biological Resources Study, *The Zoological Catalogue of Australia*, presents informative family introductions with generic and species synonymies, taxonomic information, status, distribution and ecological information, and bibliographies. The insect groups included in Volume 28 are Strepsiptera (42 species with a unique parasitoid existence), Mecoptera (30 endemic species that are important predators in natural systems and of biogeographic significance), Neuroptera (over 600 species that are important as biological control agents, with high endemism and fascinating archaic lineages), and Siphonaptera (80 valid species-group names with an impact on human health and disease, with high endemism and also exotics).
- Thompson GG & Withers PC** 1997 Comparative morphology of Western Australian varanid lizards (Squamata: Varanidae). *Physiological Zoology* 233:127-152.
- This cooperative study by researchers from Edith Cowan University and the University of Western Australia considers intra-specific and interspecific changes in body shape with size, for 17 species of Western Australian goannas. Although goannas are generally considered to be conservative in shape, many body morphometric measurements were non-isometric, indicating significant variation in shape. Canonical variate analysis clearly differentiated the two subgenera of goannas (*Varanus* and *Odatria*) and species were generally sexually dimorphic. The morphological variation among the 17 goanna species was associated with foraging mode and ecology.
- Thompson GG & Withers PC** 1997 Standard and maximal metabolic rates of goannas (Squamata: Varanidae). *Physiological Zoology* 70:307-323.
- Measurement of the standard and maximal metabolic rates of various Western Australian goannas, ranging in body mass from 10 to 3750 grams, by researchers from Edith Cowan University and the University of Western Australia indicated an unusual allometric effect of mass.

Standard metabolic rate was proportional to mass^{0.90 to 1.0}, with considerable variation between species, whereas maximal metabolic rate scales with mass^{0.79}. Consequently, the factorial metabolic scope is much greater for small goannas compared with large goannas. Inter-specific variation in metabolic physiology had some ecological correlates. Widely-foraging *Varanus tristis* and *V. eremias* had a high standard metabolic rate. Arboreal *V. caudolineatus*, *V. gilleni* and *V. tristis*, had a high maximal metabolic rate.

Tong SM 1997 Heterotrophic flagellates from the water column in Shark Bay, Western Australia. *Marine Biology* 128:517-536.

The diversity of heterotrophic flagellates in the water column at Shark Bay was examined by a researcher from the University of Sydney, and found to include 41 species of apusomonads, cercomonads, choanoflagellates, cryptomonads, euglenids, heteroloboseids, stramenopiles, and others of uncertain taxonomy. Three quarters of the species had not been previously reported from southern subtropical regions. It appears that many heterotrophic flagellates have a cosmopolitan distribution, and the biogeography of these Shark Bay species is discussed with regard to studies in other localities.

Wallace CC 1997 New species and new records of recently described species of the coral genus *Acropora* (Scleractinia, Astrocoeniina, Acroporidae) from Indonesia. *Zoological Journal of the Linnean Society* 120:27-50.

Williams ST & Benzie JAH 1997 Indo-west Pacific patterns of genetic differentiation in the high-dispersal starfish *Linckia laevigata*. *Molecular Ecology* 6:559-573.

Physical Sciences

Barton A 1997 *States of Matter, States of Mind*. IOP Publishing, USA.

This easy-to-read book introduces the structure and property of matter, how the physical world is put together and stays together. It explains some of the intricate details and some of the grand schemes of life, the universe, and everything, by making analogies with everyday experiences. Ranging from fundamental ideas and fundamental particles to the makeup of the universe, the contents of this book are understandable to readers with an inquiring mind but no scientific background. [available in Australia from DA Books: service@dadirect.com.au]

Clare BW & Supuran CT 1997 Carbonic anhydrase inhibitors. Part 41. Quantitative structure-activity correlations involving kinetic rate constants of 20 sulfonamide inhibitors from a non-generic series. *European Journal of Medical Chemistry* 32:311-319.

This collaborative research between Murdoch University and Università Degli Studi di Firenze (Italy) presents a quantitative structure-activity relationship for 20 sulfonamide inhibitors of carbonic anhydrase. These drugs, which are not of a classical congeneric series as the only common factor is the sulfonamide group, have as important local factors the Millikan charge on atoms of the sulfonamide group, and as global factors the size and shape of the molecule, calculated frontier orbital energies, and lipophilicity. The equilibrium constant and kinetic association rate were well correlated, but the kinetic dissociation rate constant was not.

Hefter G & Marcus Y 1997 A critical review of methods for obtaining ionic volumes in solution. *Journal of Solution Chemistry* 26:249-.

These researchers critically review the various methods for obtaining individual, or "absolute", ionic standard partial molar volumes from whole electrolyte data in aqueous and non-aqueous solutions. After revealing a number of undetected errors in previous analyses, it is shown that the reported agreement amongst the various methods in aqueous solution is largely fortuitous. Although all methods are unsatisfactory to varying degrees, the reference electrolyte approach, using an electrolyte such as tetraphenylarsonium, is the least objectionable. The researchers recommend that, at present, a difference between the standard partial molal volumes for Ph_4P^+ and BPh_4^- of $2 \text{ cm}^3 \text{ mol}^{-1}$ be used in all solvents at 25 °C.

Kang HJ & Fenical W 1997 Aplidiamine, a unique zwitterionic benzyl hydroxyadenine from the Western Australian marine ascidian *Aplidiopsis* sp. *Tetrahedron Letters* 38:941-944.

Kang HJ & Fenical W 1997 Ningalins a-d - novel aromatic alkaloids from a Western Australian ascidian of the genus *Didemnum*. *Journal of Organic Chemistry* 62:3254-3262.

Obšil M, Majer V, Grolier J-PE & Hefter G 1996 Volumetric properties of, and ion-pairing in, aqueous solutions of alkali-metal sulfates under superambient conditions. *Journal of the Chemical Society, Faraday Transactions* 92:4445-4451.

Apparent molar volumes for $\text{Na}_2\text{SO}_4(\text{aq})$ and $\text{K}_2\text{SO}_4(\text{aq})$ have been obtained by collaborative densitometric research between Murdoch University and Université Blaise Pascal chemists, and from selected experimental data from the literature, at temperatures and pressures up to 573 K and 30 Mpa. Using the Pitzer ion-interaction model to correlate the data, the researchers obtained recommended values as a function of temperature and partial molar volumes at infinite dilution. Ion pairing was found to be significant for $\text{Na}_2\text{SO}_4(\text{aq})$ and $\text{K}_2\text{SO}_4(\text{aq})$ at higher temperatures.

Ralph DE & Stevenson JM 1995 The role of bacteria in well clogging. *Water Research* 29:365-369.

These researchers from Murdoch University studied the effect of ochreous sludge from blocked irrigation bores on the oxidation rate of soluble Fe(II). In comparison with sterile flasks of Fe(II) solution which showed the expected first order decline in Fe(II) concentration, flasks inoculated with ochreous sludge had significantly enhanced rates of Fe(II) oxidation, with the greatest increase at pH 8.5.

Robinson BH, Chiarucci A, Brooks RR, Petit D, Kirkman JH, Gregg PEH & Dedominicis V 1997 The nickel hyperaccumulator plant *Alyssum bertolonii* as a potential agent for phytoremediation and phytomining of nickel. *Journal of Geochemical Exploration* 59:75-86.

Steinborner ST, Wabnitz PA, Waugh RJ, Bowie JH, Gao CW, Tyler MJ & Wallace JC 1996 The structures of new peptides from the Australian red tree frog *Litoria rubella* - the skin peptide profile as a probe for the study of evolutionary trends of amphibians. *Australian Journal of Chemistry* 49:955-963.

Stelbovics AT & Berge L 1997 Nonuniqueness in the close-coupling method for *e*-He scattering. *Physical Review A* 55:1028-.

These researchers from Murdoch University present a general analysis of the close-coupling equations for e -He scattering and show why close-coupling expansion gives rise to nonunique solutions and are construct equations with a unique solution. The analyses concentrate on two models of target states, a frozen-core model with one electron restricted to the $1s$ He⁺ orbital, and a model using full configuration-interaction target states.

Thurgate SM 1996 Auger photoelectron coincidence experiments from solids. *Journal of Electron Spectroscopy and Related Phenomena* 81:1-31. [review]

Webb J, St Pierre T G, Tran KC, Chua-anusorn W, Macey DJ & Pootrakul P 1996 Biologically significant iron (III) oxyhydroxy polymers: Mössbauer spectroscopic study of ferritin and hemosiderin in pancreas tissue of b-thalassemia/hemoglobin E disease. *Inorganica Chimica Acta* 243:121-125.

Researchers from Murdoch University and Mahidol University (Thailand) used Mössbauer spectra of ferritin to show that it contained iron cores based on the ferrihydrite structure consistent with previous electron diffraction data. Cores in the crude hemosiderin are generally of this type, but some have a defective goethite structure.

Note from the Hon Editor: This column helps to link the various disciplines and inform others of the broad spectrum of achievements of WA scientists (or others writing about WA). References are abstracted from Current Contents by searching for Western Australia in the title and abstract.

Other contributions to "Recent Advances in Science in Western Australia" are welcome, and may include papers that have caught your attention or that you believe may interest other scientists in Western Australia and

abroad. They are usually papers in refereed journals, or books, chapters and reviews. Abstracts from conference proceedings will not be accepted. Please submit either a reprint of the paper, or a short (2-3 sentences) summary of a recent paper together with a copy of the authors' names and addresses, to the Hon Editor or a member of the Publications Committee:

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Dr S D Hopper (Life Sciences), Kings Park and Botanic Garden, West Perth WA 6004

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Final choice of articles is at the discretion of the Honorary Editor.

"Letters to the Editor" concerning scientific issues of relevance to this journal are also published, at the discretion of the Hon Editor. Please submit a word processing disk with letters, and suggest potential reviewers or respondents to your letter.

P C Withers, *Honorary Editor, Journal of the Royal Society of Western Australia.*

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