

Curriculum Vitae

Anthea Airey

Expert Scientist – Structures, Maritime & Materials



Expertise Areas

Knowledge-based programme development

Durability

Sustainability

Chemical Mechanisms

Remedial Specifications

Heritage Restoration

Concrete and Shotcrete Technology

Qualified. Master of Business Administration; Doctor of Philosophy; Bachelor of Science with Honours.

Connected. Concrete Institute of Australia: Member, National Councillor, Past President (WA Branch); Royal Australian Chemical Institute: Member Chartered Chemist 26 years; Australasian Corrosion Association: Member; Standards Australia Committee Member (AS 1859.1, 1860.1, 1604.2, and 4266 series).

Relevance to Project: Anthea is a Scientist with over twenty five years expertise in the total building product lifecycle including product development and manufacturing, waste and pollution reduction programmes, identifying mechanisms of deterioration of built-environment materials and specifying preventative/remedial solutions.

Anthea's history of successful technical project delivery enables her to lead teams in developing targeted technical solutions and communicate effectively with project participants. Her understanding of site geotechnical and environmental challenges and their interaction with structures and materials are key to the strategic solutions supplied. Her advice includes large-scale condition and dilapidation surveys, durability modelling, investigation reports, concrete mix design assessments, materials specifications, purchasing and construction phase support, and quality assurance.

Anthea is an experienced forensic scientist and court expert witness conducting in-depth investigation and reporting on structure and civil facilities.

Anthea is highly connected as a past contributor to the Australian Wood Panels Association, Standards Australia and is presently a voluntary National Councillor of the Concrete Institute. Her past roles in CIA included President (WA) introducing a major projects keynote breakfast speaker series, and evening symposiums coordinating over 50 speakers on topics fostering excellence and innovation in concrete materials, design and construction. In addition to contributing her own papers, Anthea has contributed to Conference event organisation, peer review and as session chair.

Construction Project Experience while Technical Director – Structures, Maritime & Materials of GHD.

Durability Advisor/BHP Billiton | 1000 Tonne Bin Hopper Slab| Olympic Dam, SA, Australia

BHP Billiton wished to upgrade or replace a slab and pedestal footings of a 1000 tonner hopper at an ore processing plant in the remote location of its Olympic Dam facility, South Australia. Anthea supplied advice on the exposure zone categorisation arising from ore wash water, geotechnical reports and anecdotal evidence. She supplied the design team and client project team with concrete technology options and strategy for

durability; and performed mix design thermal risk assessments and advice for thermal control of the > 1 metre large slab pour in daytime temperatures exceeding forty degrees Celsius (2019 to present).

Materials Advisor | Supply Chain Readiness – Materials Suitability Report| GHD Advisory | Sustainability Victoria | Melbourne, VIC

GHD evaluated the readiness of the supply chain in Victoria to incorporate recycled materials. As lead

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author of the Materials Suitability Report, Anthea identified the technical suitability of substitute materials in the supply chain to fulfil raw materials input criteria as feedstock for the manufacture of building industry products.

The work considers for each of concrete, steel, glass, timber products, plastic and rubber, the extent to which existing Australian standards provide for the qualification and incorporation of recycled raw materials and re-use of waste.

The study advises whether existing usage inherently incorporates recycled materials; where detailed specifications are required to ensure recycled materials are incorporated; and supplies examples of specification clauses that will trigger recycled content usage. Technical limitations of raw material substitute programmes are outlined.

The focus of industry bodies and directions in new materials research are reported informing conclusions regarding "Supply Chain Readiness" (2019).

Durability Advisor K2 Wharf Unloader Concrete Repair | Port of Newcastle| Newcastle, NSW

A new wharf unloader was committed to by the Port, and required a heavier gauge rail system to replace existing. Following decommissioning of the existing wharf unloader, inspection by the rail installation contractor Silver Raven found significant areas of spalling and delamination at, and either side of the rail along the length of the wharf. The onset of corrosion was exacerbated by shallow concrete cover to the reinforcement, where the existing concrete had been ground to a slope to effect drainage into the rail recess. Typical epoxy shallow cover solutions were rejected due to delamination risk (a mismatch of strength of the initial concrete estimated as only 25 MPa, and many repair materials leading to disbondment). Anthea provided a repair specification incorporating a low shrinkage Portland Cement containing concrete as a repair material, to bridge the lower strength concrete and epoxy rail fixture materials and utilising a high resistivity hydrophobic strategy to protect the shallow cover reinforcement. Particular attention was paid to the surface preparation of existing concrete and verifying bond to repair materials. Anthea evaluated local mix design offerings and supplied RFI support for the contractor in order for the project to go ahead in a timely fashion prior to the arrival of the unloader (2019).

Durability & Product Sustainability Advisor | Central Station Major Works | AGJV | Laing O'Rourke | Sydney, NSW

Project Value: \$1 billion

The Central Station Main Works project aims to preserve the heritage of the existing Central Station, whilst significantly extending its capacity from 270,000 to 450,000 users within the next two decades. A new north-south concourse, an underground station known as the "Metro Box", and connections between existing concourses and tunnels including completion of connections to the Eastern Entrance are under construction.

This major adaptive re-use project required durability for all new structural elements of 120 years, with location specific Green Star and site wide ISCA requirements.

Anthea is the principal author of the site wide Durability report, interpreting environmental and geotechnical data to assess the exposure zones of the site, identify potential mechanisms of materials deterioration, and propose recommended materials selection for the structure and architectural fitouts.

Anthea led a desktop assessment optimising (reducing) the greenhouse impact of 32,000 tonnes of concrete by identifying feasible materials technology approaches through carbonation modelling (CARBUFF), thermal modelling (CIRIA C660) and sustainability modelling using Green Star evaluations. Anthea advised the Sustainability team in construction of a Life Cycle Assessment model (Simapro).

Anthea provided concrete purchasing technical support when the project was impacted by a flyash shortage, supplying advice to manage increased thermal cracking risk of available marketplace concretes for client Laing O'Rourke.

Durability Reviewer Port of Adelaide | Boat Ramp Design | Adelaide, SA

Anthea provided support to the design engineer to review and revise a durable concrete mix design and drawing notes of this maritime structure in order to assure the concrete met the client 25 year design requirement (2019).

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Durability Advisor

Western Sydney Airport | WSA Co | Sydney, NSW

Anthea evaluated Requests for Information (RFIs) from the Project Manager Bechtel Global by the Contractor (CPB Lend Lease JV) in relation to concrete technology. Queries addressed have related to the equivalence of mix designs from alternative manufacturing plants for bridge abutments on Badgery Creek Rd, construction repair methods such as crack repair methodology for fine cracks, review of bridge parapet mix design, sensitivity of the drying shrinkage parameter in a stich pour utilising 10 mm aggregate, and the air entrainment effects of water reducing agents. Anthea has made curing recommendations to optimise durability and provided advice on the interpretation of design and construction parameters to RMS B80, applicable codes, standards and manufacturer's recommendations (2019).

Project Manager

Barangaroo Hickson Rd Close-Out Dilapidation Survey| Enviropacific Services Pty Ltd | Sydney, NSW

GHD undertook a survey of several multistorey structures incorporating car parks, adaptively re-used heritage buildings and associated pedestrian spaces in 2015 prior to construction works, identifying circa 1000 defects (primarily cracks). Anthea worked with GHD's Geospatial Informations Systems team to create an inspection template incorporating the pre-construction photographs and ratings, enabling her inspection team to accurately revisit each original defect for re-assessment of condition and record new defects if any. The inspection of commercial, heritage and parking facilities was mobilised effectively leading to conclusion of inspections within a tight pre-Xmas schedule and to satisfaction of the corporate tenants. A statistical analysis of the results examined the hypothesis of whether there had been any significant change in rating of pre-existing defects (one measure of a damage impact) in addition to reporting new defects; and assessing the effect of the change in survey areas on pre- and post-construction surveys due to fitout and renovations during the period.

Technical Lead | Lake Medlow Dam

Concrete Cracking Investigation and Remediation Specification | WaterNSW | Sydney, NSW

Lake Medlow Dam is a 19.8 m high cylindrical concrete arch dam constructed in 1907 in the Blue Mountains region of greater Sydney. It was the first thin arch, high stress dam built in NSW. As part of the Greater Sydney Dams Portfolio risk assessment for Water NSW, Anthea inspected a large through-crack running at walkway level and proposed upstream remediation measures for this defect and erosion of the dam wall, taking into account environmental requirements of discharges into drinking water and the aesthetic requirements of the heritage council. (2019)

Durability Advisor | TAP 3 Fairy Meadow & Mittagong | Degnan | Transport for NSW | Regional NSW

The Transport Access Program (TAP 3) is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure. In order to provide disability access, install lifts and upgrade facilities in and around a series of train stations of NSW. For Fairy Meadow and Mittagong stations Anthea provides design support for the Sydney Structures team, and evaluates Requests for Information (RFIs) from the D&C Contractor Degnan in relation to concrete and other technologies required to meet a 120 year design life. Concrete queries addressed have related to the equivalence of mix designs from alternative manufacturing plants, the effect of retarders, cement type and aggregate substitutes. Anthea has performed indicative durability calculations to assess thermal risk of concrete mix design to piles and the effect of soft water and environmental chloride on longevity of mix designs in support of product selections for the lift pits. Technical support included identification of alternative market offerings of lift pit waterproofing solutions and evaluating deterioration mechanisms of each, and supplying advice regarding interaction with the environment and design assumptions of the concrete structure. Anthea has contributed to design development to manage steel beam/concrete slab crevices supplying galvanising, coating, joint filling and sealant design advice (January - present 2020).

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Team Lead – Condition Assessments | TAP - 3 | Laing O'Rourke | Sydney, NSW

The Transport Access Program (TAP 3) is an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure. In order to provide disability access, install lifts and upgrade facilities in and around a series of suburban train stations a combination of non-destructive techniques (NDT) and visual assessment was employed according to RailCorp guidelines. The suitability of structures and civil infrastructure including heritage buildings, overbridges and tunnels for intended repair and retrofit was assessed with concept level remedial advice supplied for the Wahroonga twin-arch overbridge and footbridge (June 2019 – present).

Technical Lead | Googong Dam Valve Pits Concrete Cracking Investigation | Icon Water Limited | Queenbeyan, NSW

At the Googong Dam facility a concrete structure housing the valve maintenance pits and associated large diameter water pipes featured significant damage. Defect types included map cracking; also large, linear cracks and areas suspected to be delaminated.

In conjunction with Greg Zambesi, Anthea designed a data gathering programme to distinguish between possible alkali-aggregate reaction (AAR), structural, water hammer, thermal and other causes of cracking, and assess structural adequacy.

Anthea assembled and led the site technical team and core drilling crew. Non-destructive testing included visual/photographic, ground penetrating radar, crack measurements, tap testing and thermal (infra-red) assessment. Discovery of the structure and depth of cracking was investigated via desktop drawing review and onsite by use of ultrasonic pulse velocity testing, ground penetrating radar assessment and flood testing (with biodegradable dye) the largest crack in conjunction with thermal imaging. DEMEC gauges were installed to measure future crack movements. Core samples containing cracks and controls were obtained, examined for depth of cracking and a petrographic report coordinated with a subconsultant laboratory, and further interpreted for a causal analysis report.

The work concluded that the structure was significantly delaminated due to thermally induced cracking of unreinforced regions of the structure, and that the map cracking was due to shrinkage

rather than AAR. Accordingly the structure was deemed repairable and structural remediation (rather than demolition) is presently in the design phase. The diagnostics significantly advantaged project timeframes by six months and costs, which would otherwise have been subject to AAR residual expansion testing (2019).

Durability Lead Comdain | Upper Canal Stage 2 | WaterNSW | Sydney, NSW

Project Value: > \$1 million

As part of the design and construct team prepared the materials specification for remediating, relining and re-building the Stage 2 section of a 100 year old unreinforced concrete canal connecting the Upper Nepean Dam to the Prospect Reservoir carrying 40 percent of Sydney's drinking water. The structure was affected by significant uplift and clay movement cracking. The Specification included degree of original concrete surface preparation, scope and specification of crack and void remediation; concrete and shotcrete specification suitable to apply to 45 degree bank incline; shrinkage characteristic, crack control and joint detailing. Attention to buildability included a shotcreting inspection and testing plan and advice on delivered slump optimisation for Comdain. Anthea took on the project manager role finalising the project and delivering work as executed (as constructed) drawings to the satisfaction of WaterNSW (2018-2019).

Technical Lead | Warragamba Dam Spillway Concrete Cracking Investigation | WaterNSW | Sydney, NSW

In 2018 GHD in partnership with Stantec were awarded a \$14.5 million concept design contract for the proposed raising of the Warragamba Dam, (which stores approximately 80 percent of Sydney's drinking water supply) as part of flood risk measures in the Hawkesbury-Nepean Valley.

Anthea led an investigation team including ground penetrating radar service to investigate map cracking of the major spillway walls at the Warragamba dam facility. Core samples were extracted at strategic locations identified and assessed petrographically for alkali aggregate reaction (AAR) and carbonation depth. The results of the study indicated there was potential for alkali silica reaction (ASR, a type of AAR reaction) however no ASR reaction was observed in the

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samples presented. The likelihood of future ASR reactions was assessed as low due to lack of a precursor mineral Portlandite. Crack depth measurements revealed that the cracks occurred to the first layer of reinforcement then terminated. An alternative explanation of the cause of map cracking was offered (drying shrinkage cracking). Carbonation testing results were supplied to the design team for consideration of possible augmentation concepts (2018).

Durability Advisor | Sydenham Station and Junction Works| Sydney Metro | Sydney | August 2018

The SSJ scope involves remodelling of the existing Sydenham Station and Junction to allow for Sydney Metro City & Southwest operations.

In support of this project Anthea undertook a durability assessment of a ballast stabiliser product "Tensor geogrid" and prepared a design life estimate for the product as installed in the project. The work involved determining the polymer deterioration mechanisms (scission) of the primary component (polypropylene), researching available geotechnical and atmospheric information to assess exposure risks, a literature search regarding temperatures of surface soils and use of manufacturer's accelerated weathering information to predict the likely service life. A durability memo highlighting site storage, installation and replacement considerations was supplied in the timeframe requested.

Durability Advisor | Crack Investigation Concrete Access Way Topping Slab – Northern Breakwater | Department of Industry, Crown Lands | Coffs Harbour, NSW

The breakwater provides pedestrian access to Muttonbird Island and to the Coffs Harbour Marina. The breakwater also protects assets in the lee of the breakwater including the Coffs Harbour Marina, Fishermen's Co-op, retail and food outlets and land owned and leased by Lands.

The breakwater's upgrade contract included the crest widening of the breakwater through the supply and placement of rock armour along its trunk. The works also included the supply and installation of concrete hanbars along the crest as well as the construction of an access way topping slab partially cast over existing.

The new topping slab was constructed but cracking occurred prior to any storm loading or heavy vehicle loading; the structural significance of it and impact on durability required understanding prior to opening to the public.

A timely desktop assessment found the major causes plastic and drying shrinkage with some expected contribution from restraint of rocks beneath. Recommendations included an extension of concrete transverse saw cuts in concrete not yet cracked; brooming in of Xypex concentrate to surface shrinkage crazing, and injection of deeper linear cracks.

Project Leader/Technical Lead Transdev | Glebe Tunnel Investigation | Sydney, NSW, Australia

Assembled a multidisciplinary team including materials, hydrogeologist and geotechnical consultants to identify and remedy water ingress into the heritage tunnel retrofitted for light rail. Hypothesis testing following a desktop assessment and workshop formalised the programme of inspection (conducted off peak) to assess the relative contribution of water ingress variables into the tunnel. Roof seepage, functionality and capacity of weepholes, perimeter stormwater drainage, central sumps and outflow drains, fate of surface runoff, origins of ballast fouling, likelihood of ground water and condition of track were considered. Anthea prepared a report with prioritised maintenance and capital improvement recommendations.

Project Manager Hort Enterprises Pty Ltd | CSA West Bin Concrete| Cobar, NSW, Australia

Anthea managed an investigation into temperature rise and temperature differential of sequential concrete pours proposed to repair a 30 metre shaft wall during a production shut (2018).

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Airey Taylor Consulting, Chief Materials Scientist, 2005-2012.

Expert Witness

Owners of Strata Plan 52597 v Pindan Pty Ltd - State Administrative Tribunal Case No. CC 6 of 2015 | Island Apartments Durability Investigation | South Fremantle | WA

Provided an interpretation of the requirement of AS 3600 "Concrete Structures" for concrete cover in a C/B2 exposure zone relevant to apartments within 100 m of the surf at South Beach, and provision of remedial recommendations to effectively restore cover and achieve the durability of 50-years \pm 20% including rusting bar chair removal concrete repair method, desalination, renders suitable for severe exposure zones and proprietary polymer modified cementitious render substitutes. The case became a precedent in Western Australia with the presiding SAT member commending the work and changing its policy on bar chair corrosion claims.

Project Leader

Governor Stirling Senior High School Oval Redevelopment | Airey Taylor Consulting | Building Management and Works | Woodbridge, Western Australia

Project value: \$1.93 million

Performed an expert investigation for client BMW to troubleshoot causes of sports oval turf death in a newly constructed oval by others over an existing municipal tip. Conducted independent report review, water sampling, soil sampling and coordination of specialised soil tests at E/Coast turf laboratory "Ground Science".

As Principal Consultant assembled and led a project design team including engineers, draftspersons, scientific staff; landscape consultants, laboratories, irrigation and geotechnical sub-consultants. Design outputs included demolition, drainage, irrigation and environmental strategy within tight site constraints ensuring minimal disturbance to the municipal tip clay capping layer

Re-designed the Oval's soil profile adapting "US Golf Association" sand sizing principles for a playable surface and turf health, with prescriptive Specification implemented during construction for offsite testing of raw material stockpiles and chain of custody QA to site.

Researched and identified source materials for phosphorus retention measures including a bio-retention basin and an infiltration interception trench for ground waters

Liaised with regulatory authorities (Department of Parks and Wildlife formerly Swan River Trust) and created a Nutrient Irrigation Management Plan for the Department of Education.

Provided technical consults during the project on organic blends to achieve topsoil water retention targets, risk assessments of tip generated gases and acid sulfate soil in tip capping layer and phosphorus in organic amendment. (2015-2016)

Project Leader – Scientific Services Aquatic Centre Condition and Service Life Projections by Core Survey| Rural Western Australia

Collie(2014), Northam (2015) and Morawa (2016) Aquatic Centres. Team leader of remote coring crew; chloride, carbonation profiling of concrete in splash, sub-splash and submerged areas; diffusion modelling to predict the time to first maintenance (reinforcement corrosion).

Senior Scientist Crocodile and Penguin Enclosure Refurbishments | Perth Zoo | Perth, Western Australia

Investigated durable alternatives to aquarium silicones and glazing interlayers affected by bacteria. Project Safety Analysis and evaluation of the environmental impact of methacrylate resins coatings and primers for polyurethane glazing sealant. Troubleshoot pool shell corrosion fueled by voids from redundant circulation pipework and formwork. Design non-toxic refurbishment of pool shells and glazing to extend life of the structures by 20 years; QA inspections (Builder: Satterly Constructions 2011/Elite Concrete repair 2012).

Project Leader Scientific Services for Contractor | Perth, Western Australia

Led team of scientists and rope access operators in abseil dilapidation surveys of 21 storey structure (14 storeys affected) to characterise cracks and concrete cover on decorative structural façade fins, QA of survey method, document findings, statistical work up of data and report. With Engineers, proposed causal mechanism of cracking (primarily

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restraint vs shrinkage). Provision of advice on extent of crack opening/closing due to thermal effects and estimated time to corrosion staining from premature rusting of reinforcement exposed to elements through cracking. Evaluated state-of-the-art crack isolation membrane and elastomeric coating systems to provide remedial options. Supplier liaison regarding site-specific material warranties. (2017)

Senior Scientist

726 Hay St | Palassis Architects | Perth, Western Australia

Conducted a dilapidation and concrete core sampling survey (40 cores) with laboratory testing establishing that 8000 m² internal slabs to be fully carbonated and cracked from original shrinkage and restraint; and internal beams below cracks affected by chloride after years of skylight leaks from a 1950's extension. A façade core survey established external soffits carbonated with some top side chloride damage, but protected by render had some residual life. Led materials and drafting team to quantify extent of remedial concrete repairs with provision of indexed remedial drawings and concrete specifications aiding construction, contract budget and QA. Contributed materials strategy to adaptively re-use the structure utilizing an innovative slab encapsulation approach to avoid demolition/recasting, specifying traditional concrete façade repairs with elastomeric paints to bridge cracking and contain lead based paints and crystalline additives on roof/balconies. Ribbon cut by the State Premier in the opening ceremony (2012).

Project Leader – Scientific Services

Aquatic Construction Industry | Perth, Western Australia

Investigation & expert witness services at the State Administrative Tribunal of Western Australia regarding deterioration mechanism of renders (pool chemicals vs construction method/cement technology) for two industry leading client builders. The consult included the development with laboratory of a scanning electron microscope methodology for determining water:cement ratio in renders, and interpretation of scanning electron microscope analysis of sections to distinguish early versus delayed ettringite formation.

Further detail of expert witness services on request.

Voluntary/Not for Profit Experience.

Concrete Institute of Australia (2009-present)

The mission of Concrete Institute of Australia is to promote and develop excellence in concrete research, technology, application, design and construction.

- Concrete 2021 Conference – Technical Committee
- National Council –2019 – present
Growth and Opportunity Portfolio.

Coordinate effort of staff or volunteers to undertake research into projects such as attracting and maintaining a diverse membership. Champion participative “In the Mix” networking webinars for isolated membership on non-technical themes such as “Women in Concrete”, “ Covid & Concrete”.

- National Council – 2015-2017, 2017-2019 – International Portfolio

Benchmarked like-minded international groups to understand how CIA compares, form strategic links, boost the knowledge base and bi-annual Conference profile and enhance opportunities for members . During this period the Concrete Institute ran conferences jointly/including European organisations RILEM, ICDC and FIB.

- ◇ Concrete 2019 – Reviewer and session chair
- ◇ Concrete 2017/ICDC – Reviewer, session chair and presenting author
- ◇ Concrete 2015 – Reviewer and Session Chair

- National Council – 2013-2015 – Knowledge Development portfolio

Focussed on how knowledge is delivered to members, such as the selection of technical materials on the web.

- Immediate Past President – WA Branch – 2013-2015

Organised branch events “Hot Weather Concrete” 2014, “Forensics” 2016 and “Design for Crack Control” 2017 with branch co-chairs and chaired the WA presentations of the national roadshow seminars “Forensics”, “Durability Concrete Structures” and “Why Does Concrete Do the Things it Does”.

- President - WA Branch - 2011-2013

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Implemented programme planning, budgeting, forecasting and financial management measures at the branch to integrate with the newly consolidated national corporation. Initiated the popular keynote speaker breakfast series, (replacing two evening seminars), and with branch team efforts to refocus the programme increased attendance by 47%. Invested general enthusiasm in developing the branch and national networks to benefit the membership.

- Vice President - WA Branch - 2009-2011

Coordinated a programme of 20 evening technical seminars hosting 36 speakers.

- Concrete 2011 Organising Committee and presenting author

Contributed to a record profit of \$250,000.

Publications.

Standards

The 16 standards Anthea contributed to are:

AS/NZS 1859.1:2001 Reconstituted wood-based panels Part 1: Particleboard and Part 2: Dry-processed fibreboard

AS/NZS 1860.1:2001 Particleboard flooring Part 1: Specifications

AS/NZS 1604.2:2001 Specification for preservative treatment. Part 2: Reconstituted wood-based Products

AS/NZS 4266 series Reconstituted wood-based panels –Methods of test (2001)

JANS 2000 Japanese, Australian and New Zealand Particleboard and MDF Standard and associated test methods.

Conference Papers

'The Performance of Concrete; Specifiers Perspective', Concrete Institute of Australia National Seminar Series, July 2018 (Sydney, Canberra).

'Effect of exposure zone changes on the concrete service life predictions of swimming pools' Concrete 2017, Biannual Conference of the Concrete Institute of Australia, October 2017, Adelaide.

'The Matrix – Concrete Science not Science Fiction' for Materials Australia, June 13, 2016

'726 Hay St – Concrete Remediation' for the Concrete Institute of Australia WA Chapter, June 2015

'Escaped Process Gases – The Unexpected in Plant Shed Corrosion' - Corrosion & Prevention; September 2014

'Protimeter Revisited for Large Scale Damp Investigations' - Corrosion & Prevention; September 2014

'What Lies Beneath – Plant Room Slab Corrosion' – Concrete 2011; Biannual Conference of the Concrete Institute of Australia, October 2011

'Concrete Carbonation – More Prevalent than Chloride Attack Down Under?' - Corrosion Control 007, Australasian Corrosion Association Inc.; November 2007

'Concrete under Airborne Attack' for the Concrete Institute of Australia WA Chapter, 22 April 2008

'Relativity of Airborne Fluoride Emissions on Human Health' - Australian Capital 14th International Congress IUAPPA in conjunction with Clean Air Australia & NZ; September 2007

Patent

Patent Application WO2001064408A1 'Impact Resistant substrate particleboard and composite material using same', 2000 (with T Franco and T Bryant).

Academic Publications

As a PhD chemist from Australian National University's postgraduate Research School of Chemistry (ranked in the top 50 worldwide at time of attendance) Anthea's research continues to attract citations (presently 117).

The work is a peer-recognized contribution to the understanding of self-assembling systems where, like DNA or ettringite, the resulting molecule has significant size and sophistication, compared with its constituent parts.

Anthea used thermodynamic structural (3D) gas phase modelling to optimize the probability of self-assembling double helical molecule formation, considering steric hindrance and enthalpy (heat of formation).

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Following this process, Anthea synthesized and characterized a series of purely right- or left-handed (chiral) ligands commencing from air-unstable phosphine building blocks, complexing the then air stable tetra-tertiary strands with metal ions, and analytically characterizing a series of 1:1 and 2:2 helicates in solid and solution phases. Anthea's PhD studies underlie her understanding of thermodynamics, organic synthesis, schlenk technique and analytical characterization methods; and examples strength in her long-term interest in applied mathematical modelling.

Airey, A.L., Bowyer, P.K., Cook, V.C., Gharib Naseri, N., Swiegers, G.F., Willis, A.C., and Wild, S.B., *Self-assembly of di- and tri-nuclear metal helicates containing homochiral poly(tertiary phosphines) and related compounds* Phosphorus, Sulfur and Silicon and the Related Elements, 144-146, 285-288 (1999)

Anthea L. Airey, Gerhard F. Sweigers, Anthony C. Willis and S. Bruce Wild
Self Assembly of Homochiral Double Helix and Side-by-Side Helix Conformers of Double-Stranded Disilver(I)- and Digold(I)-Tetra(tertiary phosphine) Helicates
Inorganic Chemistry, 36, 1588-1597 (1997)

Airey, A. L., Hockless, D. C. R., Sweigers, G. F., and Wild, S. B.
Crystal Structure of [SP-5-(R, R*)](±)-Chloro(1,1,4,7,10,10-hexaphenyl-1,4,7,10-tetraphosphadecane) nickel(II) Hexafluorophosphate*
Zeitschrift für Kristallographie, 211, 939-941 (1996)

Airey, A. L., Hockless, D. C. R., Sweigers, G. F., and Wild, S. B.
Crystal Structure of [SP-4-(R, R*)](±)-(1,1,4,7,10,10-hexaphenyl-1,4,7,10-tetraphosphadecane) nickel(II) Perchlorate*
Zeitschrift für Kristallographie, 211, 937-938 (1996)

Anthea L. Airey, Gerhard F. Sweigers, Anthony C. Willis and S. Bruce Wild
First Resolution of a Linear Chelating Tetra(Tertiary) Phosphine: Resolution and Absolute Configuration of (R, R*) - (±) - 1,1,4,7,10,10-hexaphenyl-1,4,7,10-tetraphosphadecane*
Journal of the Chemical Society, Chemical Communications, 693-694 (1995)

Anthea L. Airey, Gerhard F. Sweigers, Anthony C. Willis and S. Bruce Wild

Self-Assembly of Homochiral Double Helix and Side-by-side Conformers of a Double-Stranded Disilver(I)-Tetra(tertiary phosphine) Complex
Journal of the Chemical Society, Chemical Communications, 695-696 (1995)

Theses

Design and Synthesis of Double-Stranded Bimetallic Tetra(Tertiary Phosphine) Helicates
PhD Thesis, Australian National University, 1996

A Comparison of the Hartree-Fock and Discrete Variational X-alpha Methods for Generating Molecular Orbitals
Honours Thesis, University of Western Australia, 1987