A personal selection of 25 recent papers is presented covering various aspects of current developments in bioorganic chemistry and novel natural products such as bilinderone from *Lindera aggregata*.

The traditional Chinese medicinal plant *Lindera aggregata* is the source of bilinderone 1 whose structure was confirmed by X-ray analysis (J.-K. Liu and co-workers, *Org. Lett.*, 2010, 12, 2354). Bilinderone 1 was isolated as a racemate and has a novel skeleton that is proposed to be biosynthetically derived from methyl-linderone 2. The Chinese medicinal plant *Lysidice rhodostegia* contains a variety of phloroglucinol derivatives including lysi-dicin F 3 which has a novel skeleton including trans-fused furan rings (S.-S. Yu and co-workers, *Org. Lett.*, 2010, 12, 2390). A biosynthetic pathway to lysi-dicin F 3 from iso-valeroylphloroglucinol has been proposed.

Cryptotrione 4, from the bark of *Cryptomeria japonica*, has a novel carbon skeleton which was confirmed by X-ray analysis (Y.-H. Kuo and co-workers, *Org. Lett.*, 2010, 12, 2786). The biosynthetic origin of cryptotrione 4 has been suggested to involve a linkage between an abietane diterpenoid and a cadinane sesquiterpenoid followed by rearrangement. The structures of braslamiade A 5, a metabolite of *Paraconiothyrium brasiliense* (Y. Che and co-workers, *Eur. J. Org. Chem.*, 2010, 3302) and agrocybone 6, a metabolite of *Agrocybe salicacola* (J.-K. Liu and co-workers, *Tetrahedron Lett.*, 2010, 51, 3443) were also confirmed by X-ray analysis. Braslamiade A 5 is a bergamotane sesquiterpenoid with a novel 4-oxatricyclo[3.3.1.0^2,7]nonane skeleton, and agrocybone 6 appears to be derived by Diels–Alder addition of two illudane sesquiterpenoids. Biosynthetic pathways are proposed for both metabolites.

The first naturally-occurring nucleoside disulfide 7 has been isolated from the South Australian marine sponge *Trachycladus laevispulifer* (R. Capon and co-workers, *Aust. J. Chem.*, 2010, 63, 873). The disulfide 7 also has an unusual β-D-xylofuranosyl sugar. The marinopyrroles, including marinopyrrole A 8, are halogenated 1,3,0-bipyrrrole metabolites from the marine-derived *Streptomyces* strain CNQ-418 and show marked antibacterial activity against MRSA (W. Fenical and
The marinopyrroles have axial chirality, with their $M$-configuration having been established by X-ray analysis.


M. D. Lloyd and co-workers have shown that human $\alpha$-methylacyl-CoA racemase (AMACR) can catalyse the exchange of straight-chain fatty acyl-CoA $\alpha$-protons (*Chem. Commun.*, 2010, 46, 3348). The process was most efficient for straight-chain substrates with longer side-chains and preferentially removed the pro-$S$ hydrogen (Scheme 1). This is the first example of a racemase catalysing proton-exchange in a non-racemisable substrate. G. L. Challis and co-workers have investigated the biosynthesis of methylenomycin furans such as MMF2\(^{12}\) which act as *Streptomyces* signalling molecules (*Chem. Commun.*, 2010, 46, 4079). The results of feeding studies using various labelled L-glycerols have led to a proposed biosynthesis of methylenomycin furans involving a butenolide intermediate.

C. T. Walsh and co-workers have shown that three enzymes are responsible for the formation of 2-amino-3-hydroxycyclopent-2-enones found in a variety of natural products such as manumycin A\(^{14}\) (*J. Am. Chem. Soc.*, 2010, 132, 6402). Three tandem open-reading-frames (ORF33-35) from the ECO-02301 biosynthetic gene cluster in *Streptomyces aizunenesis* NRRL-B-11277, when produced from *E. coli*, show the requisite enzyme activities for formation of the 2-amino-3-hydroxycyclopent-2-enone ring and subsequent amide ligation. The substrate tolerance of the epoxide hydrolase Lsd19, the first enzyme shown to catalyse epoxide-opening cascades, has been examined (H. Oikawa and co-workers, *Org. Lett.*, 2010, 12, 2226). Lsd19 accepts a range of bis-epoxide substrates, generating either THF–THF or THF–THP products with excellent regioselectivity (e.g. Scheme 3).

Research by B. Shen and co-workers has generated new insight into the biosynthesis of tautomycetin 13, a highly potent and selective protein phosphatase inhibitor isolated from *Streptomyces griseochromogenes* (*J. Am. Chem. Soc.*, 2010, 132, 6663). Inactivation of two genes involved in the production of tautomycetin 13, *ttnD* and *ttnF* (which encode for putative decarboxylase and dehydratase enzymes, respectively), led to the isolation of four new tautomycetin analogues. The accumulation of these new analogues revealed the function of TtnD and TtnF and their role in the installation of the C5 ketone moiety within tautomycetin. D. O’Hagan and co-workers have solved the structure of an $S$-adenosyl-L-methionine (SAM)-dependent methyltransferase from *Arabidopsis thaliana* that combines halide ion and SAM in a nucleophilic substitution reaction to form halomethanes (Scheme 2) (*Angew. Chem., Int. Ed.*, 2010, 49, 3646). The X-ray structure of the enzyme has allowed the generation of a model for substrate and nucleophile binding.
S. Park and H. Sugiyama have reviewed the use of DNA-based hybrid catalysts for enantioselective synthesis (Angew. Chem., Int. Ed., 2010, 49, 3870). Their review focuses on the application of DNA-based hybrid catalysts in Lewis acid catalysed transformations such as Diels–Alder, Michael addition and Friedel–Crafts reactions. T. P. Begley and co-workers have shown that the first step in the Rut pyrimidine catabolic pathway involves two enzymes, flavoenzyme RutA and the flavin reductase RutF, that catalyse the initial ring opening of uracil during the conversion to 3-ureidoacrylic acid (Scheme 4) (J. Am. Chem. Soc., 2010, 132, 5550). The hydrolysis reaction proceeds via an unprecedented “oxidative” mechanism.

V. Gotor and co-workers have examined the use of whole cells from the Brazilian beans ‘feijão de corda’ (Vigna unguiculata) as biocatalysts in various bioreduction processes (Tetrahedron: Asymmetry, 2010, 21, 566). The biocatalyst was shown to reduce a wide range of moieties in good to excellent selectivities such as aromatic and aliphatic ketones (Scheme 5), β-ketoesters and the nitro group of nitro aromatic compounds. G. M. Greenway and co-workers have prepared a conducting pore glass–poly(pyrrole) material that can be used for the co-immobilisation of enzymes and co-factors as well as the electrochemical regeneration of the co-factor during the reaction (Org. Biomol. Chem., 2010, 8, 2419). The reduction of 2-phenylpropionaldehyde was used as a model reaction, with the HLADH enzyme and co-factor NADH successfully co-immobilised (Scheme 6). Electrochemical regeneration of NADH using a continuous flow reactor was possible for periods in excess of 100 h.

An efficient approach for the preparation of functionalised benzotropolones has been described using commercially available laccases to complete the final step (G. Baisch et al., Tetrahedron, 2010, 66, 3742). The enzymes were found to have broad substrate specificity and could convert both lipophilic and hydrophilic pyrogallol precursors in one step to the corresponding benzotropolone (Scheme 7). Directed evolution has been used to produce a variant of Candida antarctica lipase A (CalA) for the hydrolysis of α-substituted p-nitrophenyl esters (J.-E. Bäckvall and co-workers, J. Am. Chem. Soc., 2010, 132, 7038). The new variant allowed the hydrolysis of substrates with excellent enantiomeric excess (95–99%) and with reversed selectivity compared to the wild-type enzyme (Scheme 8).

B. Ritzen et al. have used hydroxynitrile lyase (HNL)-catalysed addition of cyanide to aldehydes for the synthesis of cyanohydrins (Scheme 9) (J. Org. Chem., 2010, 75, 3461). These cyanohydrins, which were produced in essentially quantitative yield and enantioselectivity, were used as key intermediates for the synthesis of cis- and trans-2,5-disubstituted morpholines.
T. Sugai and co-workers have developed a chemoenzymatic synthesis of N-acetyl-D-mannosamine derivatives and corresponding sialic acids from D-glucal using two enzymatic transformations to prepare advanced intermediates (Tetrahedron, 2010, 66, 4284). A lipase was used for the regioselective acylation of the C3 and C6 hydroxyls of D-glucal. Protection of the C4-hydroxyl was then followed by selective hydrolysis of the C3 acetyl using Candida antarctica lipase B. The resulting compounds were then used for the facile synthesis of the N-acetyl-D-mannosamine derivatives (Scheme 10).

C.-H. Chui et al. have demonstrated the use of dansylated alkynes such as 5-(dimethylamino)-N-(4-ethynylphenyl)-1-naphthalenesulfonamide 15 as antitumour and two-photon-induced bio-imaging agents (Chem. Commun., 2010, 46, 3538). The authors propose that the dual functionality of these compounds for tumour imaging and therapy could provide a flexible approach for anticancer research. S. Q. Yao have synthesised a novel unnatural amino acid 16 which mimics phosphotyrosine but has better cell permeability and hydrolytic stability (Chem Commun., 2010, 46, 2980). Incorporation of 16 into a known protein–protein interaction inhibitor showed reasonable anti-STAT3 activity in fluorescence polarisation and cell-proliferation experiments.