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the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University. Jean Dam Xth day of June 2016 ii Abstract The work detailed in this PhD involves two distinct, separate areas of research. The first project involved an investigation into the synthesis, characterization and metal- chelation of pyrido-imidazo[1,2-a]pyridines in the search for new compounds for the treatment of cancer. Previously in our laboratories at the University of the Witwatersrand a small library of imidazo[1,2-a]pyridines were synthesized that showed significant activity (IC50 values between 6.57-21.98 μM) against Caco-2 and HT-29 colorectal cancer cell lines while showing little cytotoxicity towards white blood cells; significantly less than camptothecin the 'golden standard'. In an attempt to improve the overall activity of the imidazo[1,2- a]pyridines methodology was developed to coordinate zinc, copper and platinum to the imidazo[1,2-a]pyridines to generate novel compounds. These novel compounds were characterised by NMR spectroscopy (where possible) and Single Crystal X-ray Diffraction (SCXRD) and tested against colorectal (Caco-2 and HT-29), leukemic (K562 and HL-60) and breast (MCF-7 and MDA-MB231) cancer cell lines, where the copper containing compounds showed the most significant activity. A library of 11 copper complexes screened showed excellent activity in all the cell lines tested, some of which better than camptothecin. The second part of this PhD involved a detailed investigation into novel methodology to synthesize xanthones and related diones (such as 4a-methoxy-2H-xanthene-2,9(4aH)- dione) discovered in our laboratory. It was initially reported to be a reaction mediated by ceric ammonium nitrate (CAN), however it was determined during the course of this investigation that the novel reaction was actually mediated by ceric ammonium sulfate (CAS) and that different products are isolated depending on which reagent (CAN or CAS) was used. In this thesis, the mechanism of the reaction was probed and determined that the electronic nature of the starting benzophenone (e.g. (2-hydroxyphenyl)(2,4,6- trimethoxyphenyl)methanone)

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