**Water − From Interfaces to the Bulk. Faraday Discussions, Volume 141, 2009.** Organizing Committee Chair: Martin McCoustra (Edinburgh, U.K.). Volume edited by Colin Bain (Durham, U.K.), Victoria Buch (Jerusalem, Israel), John Finney (London, U.K.), Jean-Pierre Hansen (Cambridge, U.K.), Georg Held (Reading, U.K.), Andrea Russell (Southampton, U.K.), and Richard Wheatley (Nottingham, U.K.). Royal Society of Society: Cambridge. 2009. 486 pp. $449. ISBN 978-1-84755-836-7.

This book presents the discussions held on the titled subject at Heriot-Watt University, U.K. on August 27−29, 2008. The focus is on the microscopic structure, properties, and behavior of condensed phases of water at interfaces and in the bulk, to paraphrase from the back cover. There are 21 papers as well as an introductory lecture and concluding remarks. A sampling of some of the chapters include the following: "The surface of neat water is basic" by Beattie, Djerdjev, and Warr; "On thin ice: surface order and disorder during pre-melting" by Bishop et al.; and "Water nanodroplets confined in zeolite pores" by Coudert et al. A list of poster titles, participants, and an index of contributors concludes the book.

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**Nucleic Acid−Metal Ion Interactions**. Edited by Nicholas V. Hud (Georgia Institute of Technology, Atlanta, GA). Royal Society of Chemistry: Cambridge. 2009. xiv + 434 pp. $189.00. ISBN 978-0-85404-195-4.

This book is a welcome and very detailed addition to the literature of metal ions associated with nucleic acids. It should be of interest to nucleic acid biochemists, adding a perspective somewhat different from the mainstream. Hard-core inorganic chemists will also find this volume of interest, as it may serve to stimulate and extend their interest in and contributions to the study of nucleic acids. There is a strong emphasis in this book on alkali and alkaline earth metal ions, particularly $Mg^{2+}$, which mirrors the biological roles of these metal ions within the context of nucleic acid structure and function. In general, the topics are covered in great detail, and most of the contributions are reasonably up-to-date, with references through 2008, or at least 2007. I would have preferred that the references contained complete article titles, although I realize this would have added considerably to the bulk of the volume. The figures are generally well thought-out, and there is a thorough table of contents supplemented by an index for the entire volume.

In the first chapter, Hsiao et al. give a detailed view of complexes of group I and II cations with RNA and its component nucleotides (the chapter's title inaccurately uses the term "nucleic acids" rather than "RNA"). There is a good review of the coordination of phosphate oxygens to these ions, mainly $Mg^{2+}$, illustrating the specific requirement for $Mg^{2+}$ in stabilizing RNA conformations. The authors proceed to show that $Mg^{2+}$ binds to regions of RNA whose structures in general are not shared with structural motifs. There is a thoughtful section on site-specific vs nonspecific binding of these cations and how this distinction is an oversimplification for the group I metal ions. This chapter is complemented later in the book by Schurr's review of polyanion models, which emphasizes metals acting as counterions interacting with the diffuse ion atmosphere of the nucleic acid. This is an authoritative article that covers various aspects of ion atmosphere theory, including the nonlinear Poisson−Boltzmann equation and counterion condensation theory. Nonexperts in the field may be excused if they skip this chapter, but its inclusion in the volume will be useful to those who need to learn about this topic.

The coordination chemistry of metal ions with nucleic acid bases, concentrating on transition metals, is reviewed by Lippert. He considers how this binding can or might affect the acid−base chemistry of the bases, the cross-linking of dsDNA by cis-$Pt^{II}(NH_3)_2$, the formation of DNA triplets and base quartets, and the metal-catalyzed cleavage of nucleic acid backbones, as well as a variety of other consequences of metal coordination. I was most fascinated by the potential effects of metals on the relative abundance of the rare tautomeric forms of the bases, which form non-Watson Crick pairs with the common tautomers. Such mispairing will necessarily influence rates of mutation.

The stage is then set for Hud and Engelhart's chapter on metal ions binding to specific *sequences*. The authors carefully lay out the structural evidence for sequence-dependent perturbations in B-form and A-form DNA groove geometries and hydration that bring about preferential binding of divalent ($Mg^{2+}$, $Mn^{2+}$, and $Ca^{2+}$) and monovalent ($Na^+$ and $K^+$) ions. These sequences are generally short, specifically defined stretches of nucleotides, referred to as A-tracts and G-tracts. The authors provide evidence for localization at A-tracts of $Na^+$ and $K^+$ ions in the minor groove of B-form DNA. They then discuss the interaction of metal ions with a set of specific *structures* relevant to telomeres, i.e., G-quadruplexes or quartets. The authors emphasize structural studies on alkali and alkaline earth metal ions coordinated within the restricted interior space of G-quartets but also review the effects of these cations on the thermal stability of quadruplexes, the kinetics of cation exchange, and the effects of cations on the structural polymorphism of quadruplexes.

Given the massive amount of data in the book, DeRose's chapter on spectroscopic methods used to characterize metal ion-nucleic acid binding is a welcome addition. NMR, EPR, X-ray absorption and small-angle scattering, lanthanide luminescence, and vibrational spectroscopic techniques are reviewed in this short but useful chapter that emphasizes the kinds of information these methods provide. Three chapters deal with RNA and metal ions: the thermodynamics of folding, the kinetics of folding, and RNA catalysis. Giedroc and Grossoehme contribute a detailed and thoughtful chapter on metal ions and the thermodynamics of RNA folding. The authors sort out the complicated relationships between various types of metal binding, RNA folding, and conformational change and consider both complex and simple binding models. They also review

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recent studies on the effect of $Mg^{2+}$ on the mechanical unfolding of single RNA molecules. Mitra and Brenowitz then detail the effects of the ion—largely $Mg^{2+}$—environment on the kinetics of RNA folding. The authors discuss these effects within the context of classical transition state theory and consider several folding scenarios based on the sign and magnitude of the $Mg^{2+}$ dependence. The application of time-resolved hydroxyl radical footprinting, an expertise of the authors' laboratory, is described. Perhaps the most interesting and accessible of the studies they review are the aforementioned single-molecule unfolding experiments, where the $Mg^{2+}$-induced tertiary structure of the *Tetrahymena* ribozyme vastly alters the mechanical denaturation profile. This leads to the next chapter by Frederiksen et al., an extensive survey of the involvement of metal ions in RNA catalysis. The authors review the catalytic mechanisms of a broad spectrum of RNA enzymes, including large ribozymes, RNase P, and group II introns. This is an area where there are multiple or different roles for the metal ion, depending on the particular RNA catalyst.

The final chapter by Pizarro and Sadler deals with the use of nucleic acid interactive metal ions, metal complexes, and organometallic compounds as anticancer and antiviral drugs. There is a short section on metal toxicity. Unlike the other contributions to the book, the emphasis here is on breadth rather than depth. Most readers will already have some familiarity with the platinum anticancer drugs, most notably *cis*-$[PtCl_2(NH_3)_2]$ (cisplatin), and their interaction with DNA. For many, the major value of this chapter will be as a starting point for further exploration into the chemical characterization and clinical uses of the wide variety of mainly transition metal complexes surveyed in this chapter.

This volume would have profited from a full-length introductory chapter summarizing and organizing the material in the book, which would have also allowed the successive chapters to be shortened somewhat. Most of the chapters contain sufficient introductory information so they can be read independently of each other. Although the authors endeavor to recognize connections between their contributions and other chapters in the book, there is a fair amount of repetition of material. As such, the book is an excellent resource for the professional scientist or advanced student but on its own may not be particularly well-suited as a text for an introductory or intermediate course on metal ion–nucleic acid interactions.

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**Electrochemical Surface Modification: Thin Films, Functionalization and Characterization. From the series, Advances in Electrochemical Science and Engineering, Volume 10.** Edited by Richard C. Alkire (University of Illinois, Urbana-Champaign, USA), Dieter M. Kolb (University of Ulm, Germany), Jacek Lipkowski (University of Guelph, Canada), and Philip N. Ross (Lawrence Berkeley National Laboratory, CA, USA). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2008. xiv + 346 pp. $215. ISBN 978-3-527-31419-5.

The four chapters of this volume represent an engaging selection of topics in the area of electrochemical surface modification. Although the chapters should be of great interest to researchers working in the fields covered, the volume is not a comprehensive overview of the vast area of electrochemical surface modification nor was it intended to be. Rather, the chapters provide thorough background coverage of selected topics for which few recent reviews are available and all are intended to cover topics in applied electrochemistry of technological significance, such as fabricating devices, electroplating, fuel cells, electrocatalysis of dioxygen reduction, and multiscale modeling. Emphasis is on surface modification for imparting unique or specific properties to surfaces in devices. The references in the chapters are fairly up-to-date in the case of the third and fourth chapters in the volume, whereas those in the first two chapters are primarily four or more years older. The authors of the second chapter clearly state that the coverage is as of 2004.

The first three chapters present extensive experimental data and theoretical interpretations. In the first one, Michaelis reviews the properties of the thin-film oxides of the "valve metals", i.e., Ti, Zr, Hf, Nb, Ta, and Al. The application of combined electrochemical and optical methods to study these films and details of the oxide structures, dielectric properties, and implications for device performance are covered in detail. The second chapter by Moffat et al. covers approaches to promoting smoother and more conformal film growth in electrodeposition via the use of additives or catalysts. The thorough discussion of the theoretical understanding of the mechanisms of geometric leveling or surface brightening by these additives is an appealing feature of this chapter. Scherson et al. survey the applications of transition metal macrocycles to dioxygen reduction in Chapter 3 and describe the wide range of molecular structures used, results from rotating ring-disk and other electrochemical methods, optically transparent thin-layer electrode experiments, proposed catalytic mechanisms, and supporting experimental evidence. They also discuss heterogeneous catalysis by these species that are adsorbed or linked to surfaces and focus on recent developments related to experiments in which heating the macrocycles adsorbed on high surface area carbons thermally activates them through some not yet clearly understood chemical transformations and can under certain conditions enhance the catalytic activity.

The final chapter by Braatz et al. concerns multiscale modeling, which is noted as an emerging priority area for a number of funding agencies. The general concepts of multiscale modeling are covered, and electrodeposition of copper and ion implantation are used as specific examples.

Those seeking background in any one of these topics will find the chapters most informative. Coverage in the first three chapters can serve as a thorough introduction to their respective topics and the basis for then delving into the literature. The final chapter provides a good introduction to the ideas of multiscale modeling for the uninitiated and does so in the context of electrochemistry and the theme of the volume.

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**Annual Review of Physical Chemistry, Vol. 60.** Edited by Stephen R. Leone , Jay T. Groves (both at University of California, Berkeley), Rustem F. Ismagilov (University of Chicago), and Geraldine Richmond (University of Oregon). Annual Reviews: Palo Alto, CA. 2009. xiv + 524 pp. $84.00. ISBN 978-0-8243-1060-8.

As with previous volumes in this series, this book features a range of papers written by experts in their respective areas in the broad field of physical chemistry. The opening chapter is John Waugh's reflection on his life and work as a scientist in the field of nuclear magnetic resonance (NMR), and the remaining 23 chapters cover an array of topics from ultrafast multidimensional NMR, to the nanofabrication of plasmonic structures, to equation-free multiscale computation. The book concludes with a Cumulative Index of Contributing Authors, Volumes 56−60 and a Cumulative Index of Chapter Titles, Volumes 56−60. An online version is also available.

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**Electrocatalysis: Theory and Experiment at the Interface. Faraday Discussions, Vol. 140.** Edited by A. Russell (Southampton, UK), E. Ahlberg (Göteberg, Sweden), C. Korzeniewski (Texas, USA), E. Savinova (Strasbourg, France), and P. Unwin (Warwick, UK). Royal Society of Chemistry: Cambridge. 2009. 454 pp. $449. ISBN 978-0-85404-123-7.

This *Faraday Discussion* features the contributions of experts who participated in a meeting on the topic of electrocatalysis that was held at the University of Southampton, UK on July 7−9, 2008. As Andrea Russell points out in the Preface, the goal was to gather "papers from theoreticians that would reach out to experimentalists, experimental/spectroscopy papers that were pushing the boundaries of the techniques to provide new information, discussion of the state-of-art catalysts for both the hydrogen and oxygen reactions, and a desire to see that electrocatalysis is more than just fuel cells." It includes 22 papers in the following areas: structure in electrocatalysis; structural effects in electrocatalysis and fuel cells; hydrogen reactions and novel electrocatalysts; and biological electrocatalysis and alcohols as fuels, as well as an introductory chapter—whose title is the same as that of the book—and concluding remarks. The volume concludes with a list of poster titles that were presented and discussed at the meeting, a list of participants, and an index of contributors.

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