BioArchitecture 2:1, 1–1; January/February 2012; © 2012 Landes Bioscience

BioArchitecture
A reflection on 2011 and looking forward to 2012

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Volume 1 has defined the scope of *BioArchitecture*. From the outset we have strived to ensure that *BioArchitecture* is not limited to the three major polymer systems of the cytoplasm. I am happy to say that a cursory glance at the contents of volume 1 makes it clear that we are interested in all aspects of bioarchitecture from molecules to polymers to cells to tissue to the organism.

What is Bioarchitecture?

At its simplest, it is at the very core of biology. What separates biology from chemistry and physics? Perhaps Schrodinger would be disappointed by the answer; although I doubt it. He did argue in *What is Life* (1944) that the challenge was to understand how physics and chemistry could be organized in time and space within the boundaries of a biological organism. There was enthusiasm for the possibility that biology would provide a new scientific discipline with principles not predictable from physics and chemistry. Instead, biology has given us the elegance of physics and chemistry organized in time and space to create a remarkable range of biological organisms. There has been no need to go beyond physics and chemistry. Indeed, the triumph of biology is the control of chemistry and physics in space and the ability to regulate it in time.

Bioarchitecture is all about understanding this organization of physics and chemistry in biological space and how this is regulated in time. Visualization of this organization is being greatly advanced by the capacity to perform single molecule biochemistry and physics in living systems. However, there are many levels to bioarchitecture.

The structure of all living systems is remarkably crafted to suit their survival and propagation. From T4 phage to the leaves on trees and the human hand, the architecture of these biological systems has evolved structural properties to achieve the required biological outcomes.

The organization of cells and their extracellular matrix to create functioning tissues with a sense of functional integrity must ultimately be explicable in terms of molecular interactions with associated physical properties and chemical signals which integrate the whole.

Our understanding of intracellular space has gone through a profound transformation in the past 30 years. What was once biochemical stew is now revealed as exquisite spatial choreography which organizes the chemistry of the cell and its ability to both generate and respond to physical forces. The intrinsic dynamic nature of cell chemistry and physics provides both extraordinary flexibility and at the same time structural integrity. While this is most easily understood in terms of polymer systems, it is as relevant to membrane organization, compartmentalisation of signaling systems and the organization of metabolic pathways.

The nucleus is increasingly revealing structural features which underpin nuclear function. Although it is hardly surprising that specific domains are required to organize splicing and transport, visualization of these domains and their dynamics has been challenging. This is now extending to the architecture of chromatin to create structural domains which are likely to be intrinsic to transcription and replication. In retrospect, this should not be too surprising given that we are dealing with nature's largest polymer. It would be unlike evolution not to take advantage of this opportunity.

Looking Forward to 2012

I want to thank our contributors to the first volume who have set the scope for the journal and pointed the way forward. In the coming year we are looking to expand our coverage of topics relevant to the architecture of biological systems at all levels. We encourage you to contact myself, Associate Editors or members of the Editorial Board with any ideas for reviews and the toolbox (Everything you need to know about…) in addition to original article contributions.

Last and most, I wish to thank all the Associate Editors and members of the Editorial Board for their commitment to the journal.

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Submitted: 04/09/12; Accepted: 04/09/12
http://dx.doi.org/10.4161/bioa.20320