The aim of Analytical Cellular Pathology remains the publication of high impact scientific articles that focus on quantitative aspects of pathology, with an emphasis on the application of biophysical techniques to the study of cells, tissues, and organs in disease. Rapid advances in molecular biology, physical probes, computational analysis, and systems biology provide the tools for an integrated approach to the full understanding of disease processes, their prevention, and treatment. Molecular biology has progressed from identification and cloning studies that might more properly have been called “molecular anatomy” to a study of the interplay of the molecular building blocks in metabolic and signaling pathways, and the meta-organization of these pathways with respect to their interactions and regulation in all aspects of normal and abnormal function of the organism. This has led to an explosion of new approaches to the elucidation of disease mechanisms and the design of new strategies for clinical detection and therapy. Nevertheless, many of these studies do not recognize that the reactions, processes, and pathways do not occur in a homogenous sac of protoplasm out in the real world, but rather at discrete loci within highly structured cellular and tissue environments. This means that physical, chemical, and electrochemical barriers, as well as diffusion constraints are important determinants of biochemical behavior. Cellular structure and scaffolding themselves may play regulatory roles; for example replication origins are found in relation to nuclear matrix and appear to be coordinated by those structural elements.

Since spatial distribution plays such critical roles, imaging and imaging studies are as important as molecular analysis itself, provided that we do not confine ourselves to mere phenomenological and phenotypic observation. Fortunately, we are now in the era of whole spectrum, multi-modality computer-intensive analysis. Confocal-based techniques allow the detection of molecular interactions as well as localization of such events. Tomographic techniques developed initially for radiology have found a place in many aspects of imaging that are of interest to pathologists, and can even be applied to data sets that are not obtained from traditional imaging approaches, such as impedance tomography. More sophisticated forms of computational analysis can improve resolution, overcome to some extent problems such as light scatter, and extract quantitative data from images derived from a variety of sources.

These advances are not only tools for the study of basic mechanisms of disease, but are slowly moving towards clinical application in providing diagnostic and prognostic information about disease. Even more exciting, many of these have the potential for in vivo analysis not only in experimental models but also of actual patients in real time. Just as virtual colonoscopies have become an important diagnostic tool for radiologists, pathologists are inexorably progressing towards virtual biopsies.

In order to promote awareness of these new approaches, Analytical Cellular Pathology has published, in previous issues, a series of reviews titled “Modern Trends in Imaging”. These reviews and additional material have been published as a book in the “Studies in Health Informatics and Technology” book series from IOS Press. In the time leading to publication, many additional emerging technologies have evolved to the point where they have also become more relevant for cutting-edge pathology research. As indicated above, spatial distribution can be an important parameter in the mechanisms underlying biological phenomena. Even with the armamentarium described above, analysis of a two dimensional slice of cell or tissue represents only a random sampling of the complex
information in that sample. Additionally, because of the stochastic nature of both biochemical processes and their locus of activity within the cell, it is not sufficient to simply study molecular events in the absence of context relating to cellular compartments and inter-relationships among these. For this reason, 3D reconstruction methods are becoming of increasing importance, and being applied both to traditional modalities and emerging new technologies. We hope to review this field in the near future and encourage the submission of articles utilizing such methodology.

We will also be accepting brief communications on this and other topics, which will be refereed under the same mechanism as full scientific articles, but which may emphasize methodology in addition to those that are mechanism oriented. Scientific progress comes not only from hypothesis-testing but also from hypothesis generating data, and both are important, especially in relationship to translational research.

Unfortunately, the technologic basis for these approaches is expanding more rapidly than our ability to exploit it for both diagnostic and experimental pathology. While the theoretical and practical underpinnings of the new technology are complex, the underlying physical principles are straightforward. However, since much of the developmental work has been performed by physicists and engineers, published material is frequently not “comfort food” to biomedical scientists, and to many, mathematical underpinnings can be daunting.

For all these reasons, while the range of reviews in *Analytical Cellular Pathology* will expand to include all aspects of quantitative molecular analysis and imaging, we will continue to focus on imaging approaches, computational image analysis, and digital pathology in general. To this end, I have added a group of Review Editors to the editorial group of the journal whose responsibility will be to seek out such timely topics, and potential authors from the many top-notch scientists working in these areas. Examples of some future topics for coverage include photoacoustic tomography, enhanced phase contrast tomography, holographic tissue dynamics spectroscopy, and exotic materials imaging among others. We will also welcome brief commentaries or counterpoints relating to such reviews in order to expand the dialog among us. We will establish and publish a procedure for this and other new features in the near future. However, our main thrust remains the publication of original scientific articles. As the number of such articles increase during this early growth phase of the journal, there may be constraints on the rollout of such new features.

As I have noted previously, there appears to be a convergence of radiology and pathology. As indicated above, both disciplines make use of imaging as an essential, but not sole component of their diagnostic armamentarium. While pathologists have made tremendous contributions to both basic research and diagnosis in the molecular realm, the application of the new imaging technologies has been lagging, to the point where some have questioned the future relevance of morphologic cell and tissue analysis. It is our hope that our journal can serve as a site for the publication of research in this area and as a forum for the dissemination of knowledge that can further shape interactions among pathologists and colleagues in engineering and the physical sciences. By taking advantage of that shared experience in exploring both optical and other biophysical properties of cells and tissues, pathologists can ensure that morphologic-based research remains relevant and be equal partners with radiology in next generation personalized medicine.

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