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Detection and functional analysis of highly dense, self-assembled nanoarrays of double helical nucleic acids

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The inherent property of nucleic acids to self-assemble permits the spontaneous formation of highly dense nanoarrays of RNA and DNA in confined spatial locations. Such self-assembly provides the basis for development of programmable nanodevices with single-molecule detection capability.

Moreover, highly-dense self-assembled nanoarrays allow the requisite confinement of single-cell amounts of DNA or RNA that can be recognized by proteins and other ligands. Detection also can be achieved in a label-free manner by using probes that directly alter the physical or chemical state of the nanoarrayed nucleic acid. Specifically, ribonucleases and deoxyribonucleases can act on laterallyconfined,self-assembled monolayers of double-stranded RNA or DNA, respectively. The change in height of the arrayed nucleic acid as a result of nuclease action can be detected using atomic force microscopy. The retained processing reactivity of nanoarrayed nucleic acids forms the basis of novel approaches to biomarker detection.

Biography

Allen Nicholson received his Ph.D. in chemistry from the University of Pennsylvania, and was an NIH Postdoctoral Fellow at the Rockefeller University. He is currently Professor and Chair of the Department of Biology at Temple University. Professor Nicholson has published extensively on the catalytic mechanisms and gene-regulatory functions of ribonucleases, and has edited two monographs on ribonucleases. His research program has recently expanded to include the development of novel self-assembled RNA nanoarrays to analyze RNA-protein interactions.

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