Cellular and Molecular Biology

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Technological Frontiers in Cell Biology

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Microscop has re olutioni ed the a rd thlio o -[illegible]CdtaCs d ild e [illegible] ing -[illegible] [illegible]tC rc0.[illegible] en mes fnctioned. E er since the microscopic de ices ere in ented there has been constant impro ement in the technolog and in fact the de elopment of high resolution orescence microscope has resulted in conferring Nobel Pri e in Chemistr in the ear 2014. In the ear 2017 the pri e ent to the de elopment of cr o-electron microscope. e nderl ing orking principles of these microscopes di er a great deal. In orescence microscop the orescence molecules are used to light the target proteins,, cells, and other cellular components, and e en allo s the biologists to isuali e the li ing samples on a real time basis. Ho e er, there as a limitation that isible light cannot di erentiate components closer than 200 nanometers. erefore electron microscope as de eloped in order to achie e greater resolution. But ho e er this technique required the acuum that limited its use for isuali ing li e cells. erefore ol techniques of cr stallograph ere replaced ith the indi idual or combined usage of these microscopes.

Wide eld microscope functions on the intense light source to illuminate the specimen. Confocal microscope as de eloped that uses a pin hole to illuminate the point of interest. is enables remo al of backgrond orescence and out of focus elds and hence a higher resolution and contrast as obtained in e ect. Light sheet microscop functions b scanning the samples based on a er thin plane of laser light and this technique allo s real-time tracking of the li ing cells and tissues. Similarl the structured illumination microscop also allo s the magni ed isuali ation of the li e cells. e most ad anced electron cr o-microscope has the potential to re eal that atomic structures of biomolecules such a large protein. is has man ad antages o er X-ra cr stallograph because ith this techniques the samples required to be ed and a cr stal form.

is impro isation in the techniques of cell biolog as de nitel not possible ithout the in ol ement of ph sicists, mathematicians and statisticians. Computer scientists and statisticians ha e also contributed for the impro ed image processing and anal sis. e s nergistic e orts of the cell biologists and the other professions ha e enabled the isuali ation of cellular tra cking path a s in the li e cells at greater resolution. e interactions bet een the di erent organelles could be seen b capturing three dimensional color footage of light sheet orescence microscop combined ith confocal microscop . is has opened ne [illegible] for the aspiring cell biologists to design ne e periments and test the biological h pothesis. Se eral of the cellular processes including mitosis and meiosis ere decoded using these ad anced microscopic isuali ations. Understanding of inter molecular interactions has great rele ance in the pharmaceutical sector. On an o erall basis the imaging capabilit at sub cellular le els has open ne a enues and far more attracti e for the researchers ho are interested in cell biolog and its applications.

Genetic screening and editing ha e enabled the scientists the reengineer the cells and cellular processes and during these process the in ol ement of mathematical, statistical and computer science ha e been phenomenal. Due to ad ancements in the technolog such as genetic engineering for e perimental cell biolog large scale e periments ere possible and this has resulted in generation of huge olumes of comple and d namic data that needed to be anal ed and interpreted. e di ersit and the magnitude of the molecular and ph siological processes necessitated the anal sis of the data generated to deri ed logical interpretations. Genetic reprogramming is enabling the scientists to reengineer the cells such that the detect an abnormalit in the earl stage. e technique is also enabling regenerati e medicine and cell regeneration and tissue reconstructions. e computation pro ess, machine learning and modeling has enabled anal sis of ariables associated ith thousands of genes and gene combination e ects. All the technologies ha e facilitated s nthesis and production of biological therapeutics such as monoclonal antibodies for arious therapeutic applications. Cell biolog is increasingl becoming more rele ant to health science that e er before.

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