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Editorial

Elie Metchnikoff (1845-1916)

The process of scientific creativity is an enigma. Discoveries have often been made by those with scant respect for the scientific method. Metchnikoff was an impatient genius whose ambition and enthusiasm were incompatible with the slow pace of scientific method. He started sending hastily written scientific papers to journals while he was still in his teens (1). It was not unusual for him to make an observation, rush it to an editor immediately, and subsequently observe something contrary. Then he would again rush a note to tell the editor not to publish his paper because he had made a mistake. He dreamt of name, fame and distinction before he was twenty. But few except his mother, his wife and he himself believed it possible till he was forty. He was either busy with bouts of feverish activity doing some weird experiments which few could make much sense of, or engaged in bitter quarrels because he felt nobody was prepared to understand or appreciate him. When he was doing neither of these, he was contemplating suicide because he was convinced life was not worth living. Fortunately for mankind he never succeeded in committing suicide, and fortunately for him his 'methodless' experiments yielded a discovery which brought him the Nobel Prize in 1908 (2). As is widely known, the discovery which brought Metchnikoff name, fame and the Nobel Prize, was phagocytosis. He arrived at this discovery in a totally unpredictable fashion. In 1865, when Metchnikoff was just twenty, he studied intracellular digestion in a flatworm. During the next seventeen years, he drifted from one subject to another, and went through more than his share of ups and downs of life. But the intracellular digestion that he had observed in flatworms remained at the back of his mind. His fertile mind put together several apparently unrelated observations and, on rather flimsy evidence, he visualised an essential similarity between motile cells of flatworms, unicellular organisms, and white blood cells. If the first two carry out intracellular digestion, why not the last one too! He surmised that the motile tissue cells (macrophages) and white blood cells which collect at sites of injury and infection perform intracellular digestion, but here the purpose of digestion was different from that in unicellular organisms and flatworms. He proposed that here the purpose of digesting the ingested microorganisms was to defend the host. To test his ideas, he introduced some thorns beneath the transparent 'skin' of the larvae of starfish. Next morning he was delighted to find that the thorns were surrounded by motile mesenchymal cells. Encouraged by this observation, and goaded by criticism, he designed several ingenious experiments to test his hypothesis of defence by these motile cells, which were later called phagocytes. However, some valid criticism of his views continued to persist. There were at least two other prevailing views, which he had to contend with. First, that microorganisms penetrate leucocytes and multiply within these cells. Thus leucocytes were viewed as a favourable site where microorganisms could thrive. Second, microorganisms are first killed by humoral defence mechanisms, and then phagocytosed for final disposal. Today we know that Metchnikoff's views as well as the other two views had some substance. Metchnikoff was right in that there

are situations in which leucocytes defend the body by ingesting and digesting live microorganisms. But there are also microorganisms which multiply rather than die intracellularly, and are dealt with by more elaborate defence mechanisms. And there are microorganisms which can be killded only by the cooperative effort of humoral factors (antibodies and complement) and phagocytes. These historical facts remind us how easy it is to forget the obvious possibility that differing points of view are not necessarily mutually exclusive. We have used the one hundred and fiftieth birth anniversary of Metchnikoff, the founder of modern immunology to recall how his thoughts drifted from digestion to defence, and the drift turned out to be in the right direction. It would be appropriate to end this tribute with these words of David Baltimore : "Pathfinding science often involves a creative leap, an understanding that goes beyond the data to reach an intuitive truth".

REFERENCES

1. De Kruif P. *Microbe Hunters.* London : Jonathan Cape, 1963 : 225-252.
2. Biography. *Nobel Lectures. Physiology or Medicine.* 1901-1921 Amsterdam : Elsevier, 1967 : 301-303.