Cancer is a devastating disease that touches the lives of millions of people around the world. After many years of work by thousands of scientists and clinicians around the globe, the overall survival of people who acquire certain types of cancer has been dramatically improved. However, the overall survival rates for some forms of cancer remain stubbornly low. It is, therefore, imperative to devise novel avenues of study to stimulate new opportunities for drug development, and identification of new tools for early diagnosis and disease monitoring.

One such emerging area of intensive research is the concept of the tumour microenvironment. Cancer cells do not grow as a homogeneous mass, existing in isolation from other cell types, but rather in collaboration with other cells in the environment of the tumour. These stromal cells, which under normal conditions support the function of healthy tissues, surround and perfuse the tumour mass and interact with cancer cells. This bi-directional communication in the tumour microenvironment often leads to the corruption of the stromal cells, allowing them to inappropriately stimulate and support the growth of the tumour. Understanding mechanisms of communication and the signalling mechanisms between the different cells of the tumour microenvironment holds promise as the key to developing new therapeutics that could block cancer's support mechanism.

Extracellular vesicles (EVs) are small lipid-bounded vesicles released by cells into the extracellular space. Initially thought of as merely a form of waste expulsion, they are now known to be important messengers mediating the dialogue between cells. The vesicles can deliver complex macromolecular cargo to the inside of recipient cells through endocytic or fusion events. They can directly deliver protein/lipid to the recipient cell membrane and provide ligands to trigger signalling receptors. One cell can, therefore, affect the phenotype of another cell via the transfer of EVs with specific types of cargo such as nucleic acid or protein. EVs have been shown to have a number of roles, including in regulating the immune system, angiogenesis and stress responses. Importantly, their dysregulation can have pathological effects, and their abnormal function has been implicated in cancer.

The combination of these two novel fields has led researchers to study the role of EVs in the tumour microenvironment. This convergence of disciplines has led to exciting new insights into the way in which tumours are affected by EV-mediated communication between cancer and stromal cells. Like any new field with promise it needs to be nurtured and supported. For this reason the Royal Society held a Science Meeting in January 2017 entitled ‘Extracellular Vesicles and the Tumour Microenvironment’. This exciting meeting was well attended and resulted in this special edition of the Philosophical Transactions B. In this special edition, we start with a more detailed introduction to the topic and the meeting [1]. The rest of the special edition, which includes reviews, opinion pieces and research articles, describes various aspects of EV biology.
in the tumour microenvironment. The review articles and opinion pieces cover a range of aspects, including EV heterogeneity [2], the role of lipids and EVs in tumour progression [3–6], EVs in cell senescence [7], cell death [8] and immune function [9], and the way in which miRNAs carried by EVs can act as ligands to trigger the activation of receptor proteins [10]. The research articles describe how EVs released by ovarian cancer cells treated with chemotherapy can affect other cells in the vicinity leading to tumour progression [11], and how EVs released by glioblastoma cells can alter human astrocytes leading them to be pro-tumorigenic [12].

The exciting field of EVs in the tumour microenvironment is growing rapidly. Greater understanding could lead to novel therapeutics to tackle cancer, and new tools to aid diagnosis and prognosis. We hope that readers will enjoy this special edition of Philosophical Transactions B, which sheds light on this highly topical and flourishing field.

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