

Preface

In a presentation to the Linnean Society of London in November 1831, the Scottish botanist Robert Brown (perhaps better known for his discovery of Brownian motion) mentioned almost as an afterthought that in orchid epidermal cells, a single “circular areola” could be seen, a “nucleus of the cell as perhaps it might be termed.” Thus, the term “nucleus” (from Latin *nucleus* or *nuculeus*, “little nut” or kernel) was born for the compartment of the eukaryotic cell that contains the majority of genetic information.

One hundred and seventy-seven years later, we know that the nucleus is the site where genetic information is stored in the form of DNA, and where it is protected from damage, duplicated, divided, recombined, repaired, and “expressed.” For the latter, the genetic information is faithfully transcribed from DNA to RNA, then released from the nucleus into the surrounding cytoplasm. Most likely translated into polypeptide chains, the information re-enters the nucleus in the form of diverse proteins that function in the processes listed above.

These fundamental events of life rely on a multitude of tightly interconnected processes which make the nucleus by far the most complex organelle. The nucleus is surrounded by the nuclear envelope, a double membrane enclosing the entire organelle and separating its contents from the cellular cytoplasm. This membrane is impermeable to most molecules; nuclear pores, therefore, are necessary to allow for the controlled movement of molecules across the envelope. Nuclear transport is fundamental to all cell function, as movement through the pores is required for both nuclear and cytoplasmic transactions.

While the nucleus was first identified in a plant, we know now far less about the plant nucleus than we know about its equivalent in animals or in fungi, because the field of nuclear biology has been predominantly driven by the non plant model systems. More recently, however, plant biology has begun to catch up as research groups worldwide actively address the processes that define the plant nucleus. As in other areas of molecular cell biology, it is becoming increasingly evident that spatial organization of nuclear processes is also of crucial importance; in other words, for many processes the question “where?” is as important as the question “how?”

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