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**Special issue for Biology of the Cell
“Intracellular Trafficking of Viruses”**

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In this special issue of *Biology of the Cell*, the authors explored the literature describing how viruses exploit various host machineries to enter, replicate and exit from cells. The review by Gerber-Tichet & Kremer described the variability in human adenoviruses immune response which is important for the design of virus-based vaccines. Focusing on skin cells, they described the role of various adenovirus receptors for efficient infection of immune cells. They also highlighted the importance of post-translational modifications of cell surface proteins in virus uptake (1). Because virus-receptor interactions and subsequent viral fusion with host membranes cells are highly dynamic processes, advanced imaging tools are needed to shed light on virus entry. S.Padilla-Parra reviewed key microscopy approaches to study these steps in the context of HIV-1 entry and fusion, including single particle tracking and spectral imaging (2). The actin cytoskeleton plays a pivotal role during virus entry, but also exit from cells. The review by Serrano et al. described how HIV-1 remodels the actin cytoskeleton during virus-receptor interactions, and propose a model for the role of the actin cytoskeleton in HIV-1 assembly, budding and release (3). Viruses have evolved numerous strategies to travel within the cell from compartment-to-compartment. The review by Prasad & Bartenschlager describes how SARS-CoV-2 impacts intracellular trafficking pathways, including hijacking of endosomal transport, modulation of ER/Golgi/endosomes membrane contact sites, inhibition of cellular mRNA nuclear export, perturbation of protein translocation to the ER, and maturation of autophagosomes to favour viral release (4). Upon replication, all the components of the viral particle must meet together. This step requires tightly regulated transport machineries to allow assembly of the viral genetic material, capsid, and envelop proteins, all strictly necessary for efficient infectious virus production. The Hepatitis B virus (HBV) exhibits a wide diversity of particle types which have different intracellular origins. As highlighted in the revue by R.Prange, this makes HBV assembly and release a complex pathway to be studied (5). Indeed, HBV requires Core nucleo-cytoplasmic shuttling for successful replication, but the virus also exploits the ER machinery, multivesicular bodies and/or secretory autophagosomes to assemble and bud out. In contrast, many negative-sense, single-stranded RNA viruses build their own replication organelles in the cytosol, forming membrane-less

inclusion bodies. Nevertheless, Diot et al. emphasized that subverted host machineries are highly needed to promote virus ribonucleoprotein export (6). Among them, the cytoskeleton and small Rab GTPases are finely regulated to allow for efficient virus release. The reviews from this special issue all highlighted that cellular machineries are highly needed for every step of the life cycle of a virus. In particular, cells are compartmentalized to regroup specific functions, and virus components must reach the right place at the right time for successful dissemination. Although the cytoskeleton is an obvious player, transport of viral components throughout the cell is also governed by the recruitment of specific host factors that regulate the fate of viral proteins. This issue of *Biology of the Cell* "Intracellular trafficking of viruses" highlights the diversity of strategies that viruses evolved over time to take advantage of existing machineries, but it also points out that numerous host-targeting options exist to mitigate viral infection, either virus-specific or with broader antiviral spectrum.

References

1. Gerber-Tichet Dienst E, Kremer EJ. Adenovirus receptors on antigen-presenting cells of the skin. *Biol Cell*. 2022;114(11):297-308.
2. Padilla-Parra S. Time-resolved single virus tracking and spectral imaging to understand HIV-1 entry and fusion. *Biol Cell*. 2023;115(3):e2200082.
3. Serrano T, Fremont S, Echard A. Get in and get out: Remodeling of the cellular actin cytoskeleton upon HIV-1 infection. *Biol Cell*. 2023;115(4):e2200085.
4. Prasad V, Bartenschlager R. A snapshot of protein trafficking in SARS-CoV-2 infection. *Biol Cell*. 2022.
5. Prange R. Hepatitis B virus movement through the hepatocyte: An update. *Biol Cell*. 2022;114(12):325-48.
6. Diot C, Cosentino G, Rameix-Welti MA. Ribonucleoprotein transport in Negative Strand RNA viruses. *Biol Cell*. 2023;115(1):e2200059.