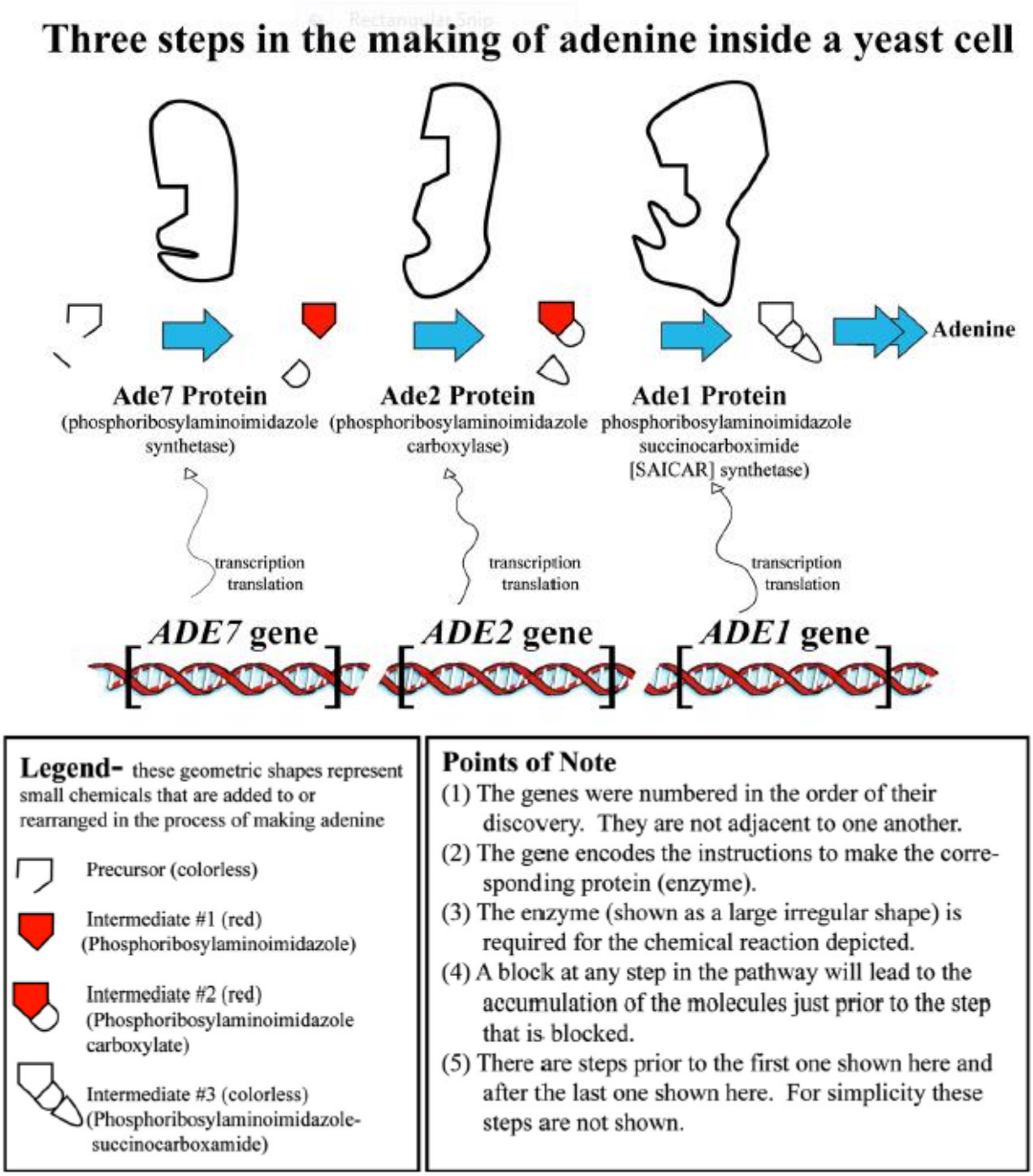

Schematic of a portion of adenine biosynthesis. In a series of steps, only three of which are shown, intermediates, depicted as small shapes, are converted by enzymes, shown as larger shapes, to form adenine. The figure indicates that these enzymes arise from transcription and translation of corresponding genes that are dispersed in the genome. Upon amutation of the *ADE1* or *ADE2* genes that causes the encoded enzyme to be nonfunctional, the intermediate

before that step of the pathway accumulates, and adenine is not formed. As indicated by the red color, when intermediates AIR and CAIR accumulate, AIR is converted to a red polymer that colors the yeast colonies pinkish red. Intermediates and enzymes in this pathway have several alternative names, which can prove confusing to students and instructors. Some of these are as follows: intermediate 1, AIR or 1-(5_-phosphoribosyl)-5-aminoimidazole or 5_-phosphoribosylaminoimidazole; intermediate 2, CAIR or 5_P-ribosyl-4-carboxy-5-aminoimidazole or 5_-phosphoribosylaminoimidazole carboxylate; and intermediate 3, *N*-succinyl-5-aminoimidazole-4-carboxamide ribotide (SAICAR) or 5_P-ribosyl-4-*N*-succinocarboximide-5-aminoimidazole or 5_-phosphoribosylaminoimidazole succinocarboxamide. Thus, the Ade2 protein is also called AIR carboxylase and the Ade1 protein is called SAICAR synthetase. One should also note that in humans these two functions are found in a single bifunctional enzyme, so the human gene *PAICS* is listed as encoding both phosphoribosylaminoimidazole carboxylase and phosphoribosylaminoimidazole succinocarboxamide synthetase. Students received two versions of the figure; in the first version the three genes and their encoded enzymes are referred to generically as A, B, and C to avoid confusion about the nonsequential gene numbering while the students formulated ideas about the genesis of the red pigmentation. The figure shown here is the second version, modified slightly for improved clarity. In this second version, the actual names of the genes and proteins are used, with the exception of *ADE5,7*. This gene encodes a bifunctional enzyme that operates at two distinct steps of the pathway, only one of which (the Ade7 step) is shown here. Thus, for simplicity we refer to this gene and protein as *ADE7* and Ade7 in the figure. The enzymes have several different names; we chose to use the simplest name or the name(s) that students would encounter during the project.