nature genetics

Desegregating science and the public

Explaining research through playful analogies can enliven discussion with nonspecialists. The limits of these analogies can be used to explore the limits of explanatory scope intrinsic to scientific hypotheses.

Communicating the details of science to nonspecialists is intrinsically hard because research entails specialized techniques for empirical testing of counterintuitive ideas. Public imagination may be more readily seized by stories that fit with preconceived models, and distortion can happen when communicators employ the most transmissible ideas. But when new concepts are successfully represented in everyday imagery, there is no reason the public cannot follow in detail the excitement of doing research. When engaged in the details of the analogy, nonspecialists can ask questions from a perspective that will be useful to the expert.

In an interview with Robyn Williams on Australian Broadcasting Company's Science Show, Oxford University researcher Kim Nasmyth explained molecular mechanisms of chromosome segregation with a riddle. In his allegory, chromosomes are represented as pairs of socks (an idea also explored by artist Gina Glover on our January cover).

Two blind men are sent by their spouses to buy socks—with the instruction that each is to buy himself five pairs of different colors—and each buys pairs of red, orange, blue, green and yellow. Unfortunately, the shop assistant puts all ten pairs in one bag. The riddle is to devise a way for the men to redistribute their socks into two sets of five pairs of different colors.

The answer is, of course, to pull the socks apart into two bags (the mechanism of the mitotic spindle), as socks are sold toggled together (standing in for the cohesin proteins used by the cell for sister chromatid cohesion).

It is important that the blind men in the riddle are choosing their socks to please their sighted spouses, rather than to express individual preferences for color. This is because the socks stand for chromosomes, and it is necessary to emphasize that they function to anticipate challenges from the external environment. The analogy continues to be useful for the nonspecialist looking to examine chromosome segregation further. A separate mechanism (a sighted spouse) is needed to bring individual red socks (now homologs) together. An alert member of the public will at this point heckle that footwear does not replicate into toggled pairs, and this will initiate a discussion between the biologist and the interested nonspecialist on differences between meiotic pairing and mitosis.

In the example given, in which each blind person picks the same five pairs, we caricature mitosis in a diploid shopping bag organism with a basic complement of five chromosomes. Variants and extensions of the puzzle can also provide insights. If the mitotic segregation process is applied to ten pairs of socks of ten different colors, this would approximate to a haploid organism of basic complement of ten chromosomes. Of course the spouses might be appalled by mismatched socks (a situation with no cellular analog), but the condition that all pairs be different would still have been met. If both men chose two pairs of red and blue, with the remaining eight pairs in the bag of all different colors, we can model a haploid organism with partial genome duplication. The mitotic implications of this are left up to the reader to explore, provided that they can maintain the attention of their listeners.

Just as each hypothesis has a limit to its explanation of natural phenomena, so the analogy used by a science communicator will eventually wear out and fail to correspond with the system it is supposed to illuminate. The way in which it does so can lead to interesting discussions and useful insights from the nonspecialist. ■