

Language

Looking for a sign

People can communicate without agreeing on the meaning of the terms

THE birth of a new language is such a rare event that scientists who want to watch it happen generally have to make do with computer simulations. Bruno Galantucci, a cognitive scientist at Yale University in America, has developed a human alternative, based on the principle that necessity is the mother of invention. He asks pairs of strangers to play a computer game in which they have to find one another in a virtual bungalow. This requires them to communicate, but the only way they can do so is by inventing a language. The game is revealing some of the secrets of successful communication.

The two players cannot see or hear each other, but they are seated at interconnected computers. In the simplest version of the game, each player is located in one of four rooms and must find each other in one move each. These rooms are arranged in a square, and each pair of adjacent rooms is connected by a doorway. On the floor of each room is an icon—a circle, a hexagon, a flower—and, prior to the game starting, the players have a short time to explore their surroundings. (Sometimes, a player with good spatial awareness can move quickly through all four rooms and understand the layout but others do not grasp it at this stage.)

The players know there is another player in another of the rooms, and that they must both end up in the same room, but they can only ever see the room they are in. To help them guide each other to a rendezvous, they have a device on which they can scrawl symbols that appear on the other's screen. But the device works like a roll of paper that constantly scrolls downwards, preventing them from writing letters, numbers or any other commonly recognisable symbol.

The first thing Dr Galantucci discovered was how quickly reliable symbolic systems emerged. Nine out of ten pairs solved the game in three hours, having agreed on a set of three or four symbols. In a more advanced version of the game, one pair developed 16 symbols in six hours.

The languages were also very different. Dr Galantucci had expected that the pairs would build their language on elements of the icons that appear on the floors of the rooms. A few did so, but they extracted different features of the icons—the number of vertices, say, or some linear abstraction of its shape. Others adopted a numbering system for the rooms—such as one slanting

line for the first room and two for the second, moving clockwise or anticlockwise through the four rooms. Another technique involved labelling the rooms by their relative position in space, by placing marks on different parts of the screen.

Some pairs solved the game in minutes, others struggled for hours and there were a few pairs who never found each other. In those cases, Dr Galantucci often saw the ideographic equivalent of a person shouting loudly in a foreign country where he does not speak the local language. Since his volunteers included Yale University post-doctoral students, he infers that building a language is no trivial task. But then what are the ingredients of successful communication?

Having observed winning pairs at play, Dr Galantucci says that communication is established as soon as one player decides to copy the symbols proposed by his co-player, rather than impose his own. At that point the pair's chances of finding each other jump. As soon as there is imitation, he says, there is a common currency. After that, it is relatively easy to attach useful information to those symbols.

Dr Galantucci is now developing the game to make it increasingly complicated by adding on extra rooms. He is also working with trios, and hopes eventually to build up to small groups—more closely mimicking the conditions in which human language evolved.

Giacomo Rizzolatti, a neuroscientist at the University of Parma in Italy who studies the origins of language, says the game is interesting because it shows the importance of imitation in language development. But he points out that the symbolic systems adopted—numerical ones, for instance—are sophisticated abstractions that would have been beyond the minds that produced the first proto-language.

One strength of Dr Galantucci's experiment that does not exist in the real world, however, is that he is able to interview his subjects afterwards. What is striking, he says, is that a pair can be successful even if a symbol represents something quite different in the virtual world to each player—as long as they agree on what they should do when confronted by it. In other words, people only need to convey a small amount of information to communicate effectively, and they can do so while holding fundamentally different ideas about how their language describes the world. ■