Interactive art and science

An increasing amount is being written about art and science and the ways in which they can interact. Editorials in *Perception* speak to this point (Gregory 2003, 2004; Tyler 2002; Wade 2003). Despite all these wise words, exhortations to scientists to involve themselves more with artists—and vice versa—appear not to have been heeded. The languages and methods adopted by each group seem to be too disparate. Perhaps we should examine the methods each employ in a little more detail. Scientists now tend to work in groups rather than individually, with the reverse for artists. The individual thumbprint of the artists on the works they produce seems sacrosanct. There are examples of artists who work in pairs, but they are rare. Scientists collaborate in order to pool their respective skills. Such a procedure seems anathema to artists, as it was once to scientists, but times (and methods) have changed.

The point has been made quantitatively by Cavonius (1999) with regard to visual science. He analysed the paper and poster presentations at meetings of the European Conference of Visual Perception (ECVP) from 1979 to 1997. In this period, the number of contributions from more than one author increased from about 46% to 77%. The trend is even starker for articles appearing in *Perception*. Examination of papers published in the years 1972, 1988, and 2004 reflects a shift from single to multiple authorship of articles (see table I): the percentage of articles published by a single person has declined as the total number of articles has increased. *Perception* was initially a quarterly journal; by 1988 it was published bimonthly, and now it is monthly. The number of papers per year was 45, 57, and 97 for 1972, 1988, and 2004, respectively. The shift to multiple authorship is dramatic, and it could reflect, in part, the emphasis placed by research-granting bodies on collaboration.

![Table 1.](https://doi.org/10.1068/p3411ed)

| Year | Number of authors per article |
|------|-------------------------------|
|      | one  | two  | three | four | more than four |
| 1972 | 67   | 16   | 13    | 2    | 2              |
| 1988 | 23   | 56   | 17    | 2    | 2              |
| 2004 | 15   | 42   | 25    | 11   | 7              |

It is difficult to know what the corresponding measure would be for artists because they present the fruits of their enquiries as exhibitions rather than as articles in journals. There are many collective exhibitions but these almost always present collections of the works of individual artists. Is it time for artists to adopt the methods of science and collaborate with one another, thereby losing their individual thumbprints on the works they produce? It could be said that this is an old method in art. In previous centuries there have been many ‘Schools of...’, where a work is known to have been produced by someone working under the direction of an established artist. Nonetheless, the value of the paintings is because of their association, however tenuous, with the great name.

In the 1920s, several of the surrealist artists (André Breton, Max Ernst, Joan Miró, Man Ray, and Yves Tanguy) produced serial works which were called *cadavre exquis*...
or exquisite corpse: one artist would draw on part of a folded sheet of paper and the next would continue, without seeing the first part, and so on. Such works could be pictorial or literary (see Adamowicz 1988). They were interactive in the sense that the final work was the product of several hands, but each step was intentionally generated in ignorance of the preceding steps. It would be odd to apply such procedures to science; the collaborators are well-informed of the entire enterprise, and each brings particular expertise to it. What we are seeking in the present context is art works that are genuinely interactive, like science—where the outcome reflects more than any of the individuals could have produced in isolation.

We offer as an example some of the art which we have produced in collaboration over the last few years, and which is more closely akin to scientific work. As with many collaborations in science, the origins were largely accidental, but the continuation is a consequence of personal as well as artistic inclination. One of us is a geometrical abstract artist who exhibits internationally, working in graphics and printing; another is an artist who programmes patterns by computer, developing software for image processing and printing programmed images with a large-format plotter; the third is a visual scientist, combining graphics and photography. All of us work principally in black-and-white, and the original collaborators are shown in figure 1 (after suitable graphical manipulation). All are concerned with the nature of perception in its manifold forms. Ludwig Wilding presented an exhibition of his art at the first conference (at Marburg in 1978) of what was to become the ECVP (see Spillmann 2003) and again at the ECVP meeting held at Bad Nauheim in 1986. His moving and stereo interference effects have been analysed in *Perception* (Spillmann 1993; see also Kondo et al 1990). As Professor of Art at Hamburg he had conducted experiments with his students in which a single drawing was made by a group working serially on the same sheet of paper. Each person could add to the drawing as he or she wished.

Our first mutual meeting was at an exhibition of Ludwig Wilding’s work held at Kaiserslautern in 1998. After a convivial opening dinner we arranged to meet again in

Figure 1. Wolfgang Kiwus, Ludwig Wilding, and Nicholas Wade, Stuttgart, 1999.
the next year with Wolfgang Kiwus at Stuttgart. The first interactive art was produced in the year that followed the Stuttgart meeting; it involved all six possible combinations between three people. Initially each produced two graphic designs and sent one to each of the others. These they could modify, elaborate, distort, or manipulate in whatever way they wished, without any communication with the originator. The products were then despatched to the third person, who could carry out similar graphical transformations. None of us knew what the final works looked like (other than the two we had each completed) until we met again—in Scotland in 2000. The titles given to the final designs reflected the sequence in which they had been worked upon and the year in which they were produced (eg KiWiWa00, figure 2). The radiating pattern, produced by Kiwus, had the geometrical overlay applied by Wilding, and Wade modulated the density of the dots to define a face. At each stage the response was to the pattern, the provenance of which was not known.

Different modes of interaction were adopted in successive years, using the methods of the artist at whose house (studio) we met. The possibilities of the interactions to be explored in the following year would be discussed at our annual meetings. Thus, in 2001 we produced works that had juxtaposed components, like the two examples shown in figure 3. The components could be placed beside one another, as in figure 3, left, or they could themselves be divided and juxtaposed, as in figure 3, right. In this case, a hidden portrait is divided into spatially separate parts and so is more difficult to discern.

Although the works started with the three men, the contributions of Christine, Ingeborg, and Isolde in deciding upon appropriate combinations of images and in

Figure 2. KiWiWa00.
suggesting modes of integration grew in importance. From 2002 the collaboration was between six people, resulting in a more naturalistic and photographic dimension to our combined designs. These can take on more abstract shapes when manipulated by the image-processing software developed by Wolfgang Kiwus, as is shown in figure 4.

Figure 3. Left, WaWiKi-a01 and right, WiKiWa-a01.

Figure 4. WaKi0902c4.
The components were a photograph of a tachiste painting which was then solarised and symmetrically reflected on itself. The strong impression of a folded surface was derived from the intensity variations modulated via the image processor.

The computer has played an increasing part in our interactions, both in terms of generating images and in manipulating them. An example of a structure incorporating all these elements, as well as the naturalistic photographic dimension, is shown in figure 5. It was produced at the meeting held in 2005 in Scotland.

We call our group AoS (Art of Seeing) and our putative logo (figure 6) incorporates all our portraits. Each meeting introduces new methods of manipulation, and constant sources of debate and dispute arise from our discussions. We have had our first exhibition (near Hamburg in 2004), and we are accumulating a body of work which we hope to make more widely available via our website: http://www.WaWiKi.com. Our collaboration continues and we all learn from our interactions. Could this be the way in which art will develop?

With art as with science, the direction ahead might not be clearly defined but that does not diminish the desire to explore further. Indeed, it has been argued by some that there is no direction ahead for art—that is, there is no way of assessing progress in art. The more constrained rules of science make progress a little easier to divine. In recent years, science has demonstrated the benefits of interactions with specialists in other, related fields of enquiry. The personal dimension in collaboration can easily be overlooked, but it is a crucial element no matter what the domain of discovery.
Perhaps art will adopt similar methods. With science as with art, collaboration could provide the key to extending our understanding of the processes involved in seeing.

WaWiKı
Nicholas and Christine Wade
University of Dundee, Dundee DD1 4HN, Scotland; e-mail: n.j.wade@dundee.ac.uk
Ludwig and Ingeborg Wilding
Buchholz/Hamburg, Germany
Wolfgang and Isolde Kiwus
Stuttgart, Germany

References
Adamowicz E, 1998 Surrealist Collage in Text and Image: Dissecting the Exquisite Corpse (Cambridge: Cambridge University Press)
Cavonius C R, 1999 “Trends in European visual science: 1978 – 1997” Perception 28 1435 – 1442
Gregory R, 2003 “Seeing—by art and science” Perception 32 643 – 644
Gregory R, 2004 “Sciart frame up” Perception 33 257 – 258
Kondo M, Wade N J, Nakamizo S, 1990 “Geometrical analysis of the motion and depth seen in moiré patterns” Bulletin of the Faculty of Literature, Kitakyushu University 22 97 – 114
Spillmann L, 1993 “The perception of movement and depth in moiré patterns” Perception 22 287 – 308
Spillmann L, 2003 “Re-viewing 25 years of ECVP—A personal view” Perception 32 777 – 791
Tyler C W, 2002 “Where art, optics, and vision intersect” Perception 31 1285 – 1288
Wade N J, 2003 “Movements in art: from Rosso to Riley” Perception 32 1029 – 1036
Conditions of use. This article may be downloaded from the Perception website for personal research by members of subscribing organisations. Authors are entitled to distribute their own article (in printed form or by e-mail) to up to 50 people. This PDF may not be placed on any website (or other online distribution system) without permission of the publisher.