in E2 binding [17]. The equivalent position typically contains an ubiquitin chain assembly
ubiquitin ligase activity. We postulate that it is the stimulus
facilitating the interaction between E2 proteins and their substrates.

in addition to the previously reported combinations of the U box with other interaction domains [4], we detected proteins with fusions of the U box with the WD40 β-propellers in the splicing factor PRP19 and with a cyclin-like peptidyl-prolyl isomerase (Figure 1). These proteins, the U-box domain could recruit E2 proteins for ubiquitination of pre-mRNA splicing complexes and unfolded proteins associated with the proline-isomerases unexpectedly. This latter role is consistent with the association of UVF2 with the AAA ATPase CBP80 in dedicated chaperone activity [4], and with the presence of a U box in the Hsp70-binding protein CHIP [19] (Figure 1).

These observations show that the RING-finger fold can be maintained even as its hallmark pattern of metal-chelating residues is abolished and that the RING fold is the common structural determinant of both E2-dependent ubiquitination and multi-ubiquitination of proteins. Determination of the U-box structure and analysis of its interaction with E2 will be the next predictions to test.

References

Binocular rivalry and perceptual coherence
Trung T. Ngo, Steven M. Miller, Guang B. Liu and John D. Pettigrew

Different images presented simultaneously, one to each eye, result in an alternating perception of each image, rather than their combination [1]. It has been suggested that such binocular rivalry is mediated by reciprocal inhibition of neurons in separate monocular channels [2]. However, recent single-unit [3,4] (see also reviews [5,6], psychophysical [7,8] and functional magnetic resonance imaging [9,10] studies suggest that binocular rivalry is resolved in the visual pathway. Despite this evidence, there is ongoing debate over whether it is the eyes or stimulus representations that rival during binocular rivalry [7,11].

With human observers, Logothetis et al. [7] rapidly swapped each eye’s presented image at a rate of 3 Hz and demonstrated that this does not induce rapidly changing perceptual alternations but rather, smooth and slow alternations indistinguishable from normal rivalry. This finding challenges eye or monocular-channel interpretations, leading the authors to postulate that it is the stimulus...
representations at high levels of the visual pathway that rival. Lee and Blake [11] recently replicated and extended this study and found that stimulus rivalry prevails over eye rivalry only under limited conditions such as low contrast.

In 1928, Diaz-Caneja [12] reported that half-field stimuli similar to those shown in Figure 1a do not rival as alternating half-field images (Figure 1b) but rather as alternating coherent images (Figure 1c). This demonstrated that the brain is able to organize components of each eye’s image into rivalling coherent percepts. In his original experiment using half-field stimuli with red horizontal lines and green semi-circles, both colour and contour coherence may have been organizing cues [12]. Colour was indeed shown to be an organizing cue in a recent study that similarly demonstrated the brain’s synthetic capacity during binocular rivalry ([8] and see earlier studies reviewed in [8]). In these experiments, dichoptically presented patchwork images were shown to rival as coherent images, though some training was required for observers to achieve this effect. Diaz-Caneja’s conclusion that binocular rivalry must be a high level process has tended to be overlooked because of the relative obscurity of the publication [12]. We therefore welcomed the opportunity to briefly replicate and quantify his work. We used the half-field stimuli shown in Figure 1a, which are devoid of colour cues. We demonstrate that subjects reported half-field perceptions (Figure 1b) for approximately half of their total viewing time (excluding mosaic percepts), with the remaining half spent perceiving full-field (coherent) percepts. The graphs beside Figure 1b,c provide the relative percentages of the subjects’ total viewing time for which each of the two types of rivalry were perceived. Both half-field and full-field (coherence) rivalry occupy roughly half of each subject’s total viewing time (see also Table 1). The periods of coherence rivalry cannot be accounted for by reciprocal inhibition of neurones in separate monocular channels and demonstrate that the brain can organize components of each eye’s image (using contour as the organizing cue) to achieve perceptual coherence. In 1928, Diaz-Caneja reported this effect using similar half-field stimuli but with colour cues as well (red horizontal lines and green semi-circles). Try observing the phenomenon of coherence rivalry for yourself using free fusion or a piece of paper to separate each eye’s image.

Data were collected over half an hour, divided into three blocks, each with four 100 second trials. Subjects sat three metres from a monochrome display monitor and recorded their perceptual alternations by pressing one of three response keys: one for either of the two half-field percepts; one for either of the two coherent percepts (these designations were counterbalanced across subjects); and the third for mixed or mosaic percepts. The latter were excluded from the percentage calculations shown in Figure 1 but are reported in Table 1. The stimuli were presented in an elliptical patch, and had a visual angle of 2.8 degrees (height) by 2.1 degrees (width), spatial frequency of 8.7 cycles/degree, and contrast of 0.9. The presentation of a different image to each eye was achieved using a VisionWorks package with NaVision stereoscopic goggles that allow the superimposition of each eye’s image so no special training in fixation was required. The results
not deny the existence of stimulus
always achieved.
perceptual coherence is not
are perceived suggests that
periods in which half-field images
contrast conditions (compare this
non-eye rivalry is not limited to low
of high-contrast stimuli shows that
proves that eye rivalry does not
Diaz-Caneja’s early suggestions and
is taking place.
not necessarily suggest that
‘stimulus representation rivalry’
refers to this as ‘coherence rivalry’
create coherent rivalling images on
indicate clearly that the brain can
unite aspects of each eye’s image to
representation rivalry, they would
previously support an eye
interpretation of the alternating half-
fields. They suggest that the
search for the neurophysiological
mechanisms of binocular rivalry
“should not overlook neurons whose
signals retain some signature of their
monocular origins” ([11], page 1454).
However, this suggestion must
contend with the compelling
demonstration by Logothetis and
colleagues that monocular neuron
activity bears no relationship to the
perceptual reports of monkeys
during binocular rivalry [3].
The data presented here quantify
Diaz-Caneja’s 1928 finding and serve
as a timely reminder that coherence
rivalry is not due to rivalling eyes.
Our data also show that contour
alone can serve as an organising cue
in coherence rivalry. Moreover, we
have shown that subjects report
periods of coherence rivalry without
training or prompting. The search for
the neural mechanism of binocular
rivalry continues and will require
new empirically verifiable models.

## Table 1

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Relative percentages of half-field versus full-
field (coherence) rivalry for sixteen male right-
handed subjects. The percentages for each
subject are calculated over approximately
20 min of viewing the stimuli shown in

![Figure 1a and exclude mosaic percepts, which do not fall into either category shown in
Figure 1b,c. Also shown is the number of
times mosaic, coherent and half-field percepts
were reported during the viewing period.

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