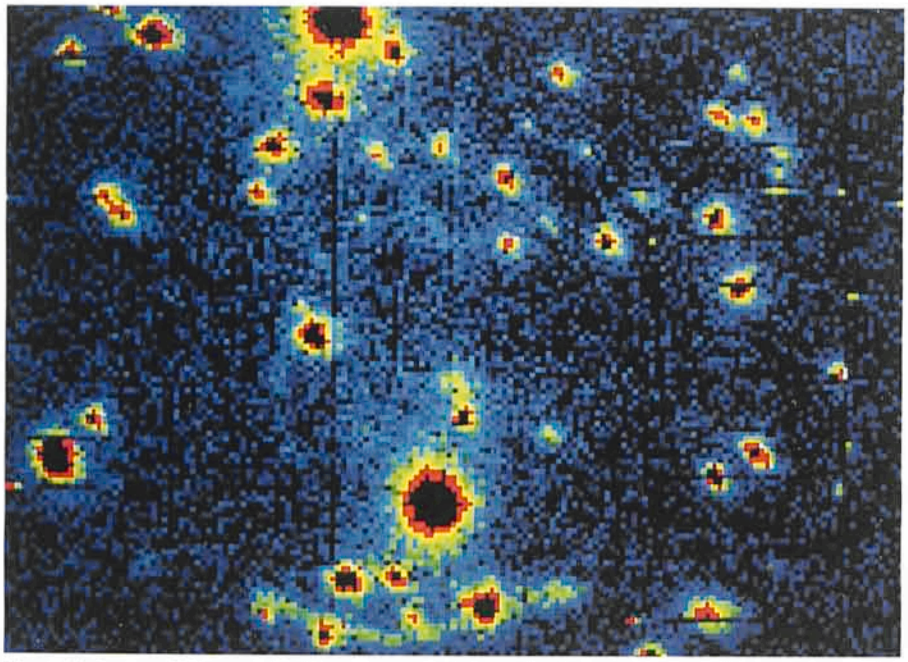

Figure 1: *Image of the core of the cluster of galaxies A 370 (z = 0.374), dominated by two giant galaxies (# 20 and # 35). The arc is located southward galaxy # 35 and has a linear size of ~ 8 kpc wide and 160 kpc long. In the lensing hypothesis it is an image of a galaxy at redshift z = 0.59. Note the galaxies superimposed on the arc, especially the brightest one (# 37) whose influence has been taken into account in the lensing model.*

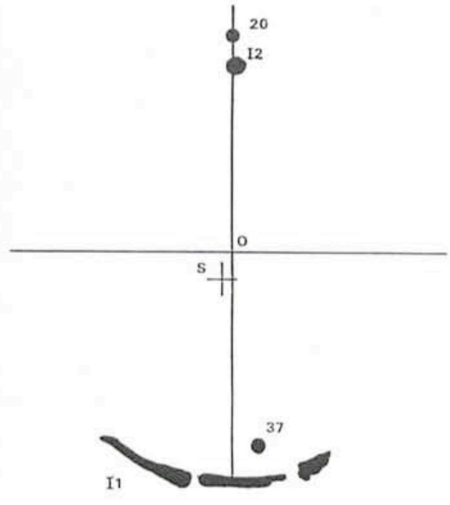

Figure 2: *Schematic diagram of the lensing configuration in a three point mass model: $2.25\ 10^{14}\ M_\odot$ for the cluster core (point 0) $3 \cdot 10^{12}\ M_\odot$ for galaxy # 20 and $0.7\ 10^{12}\ M_\odot$ for galaxy # 37. I1 and I2 are the two images of a circular source which would appear in S without lensing. Note the large break to the right of I1. The details of such a configuration will be given in a paper submitted to* Nature.

Mellier and G. Soucail), during an observing run in September 1985 at CFHT. With multi-colour photometry, we have shown that the structure is very thin and blue (2), without being able to determine its physical origin. It was then reobserved in November 1986 at CFHT and at ESO with EFOSC, where the spectrum of the Eastern end of the arc was obtained. After the data reduction, we found that the light probably comes from a galaxy at a redshift of 0.59. So our best interpretation of the phenomenon is that we are observing an exceptional configuration of gravitational lensing, with the whole cluster as the deflector and a galaxy at z = 0.59 as the source, both objects nearly perfectly aligned on the same line of sight.

In collaboration with F. Hammer from Meudon, we have modelled this configuration using a simple multi-point mass model, and compared the predictions with the observed geometry of the arc. If the system source/deflector is perfectly aligned, the theory predicts the formation of a circular ring as it has been discribed by Zwicky in 1937 (3). But if the source lies at 1″ from the cluster centre, one can predict the formation of two symmetric arcs. Only one is observed in A 370, but the second one should be located near a very bright galaxy, # 20 (cD type, see Figure 1), and the model must take into account the influence of that massive galaxy as a secondary deflector. If its mass is high enough it is possible to predict the quasi-total fading of the second arc, leading to the geometry observed in A 370. Moreover, we have studied the influence of the brightest galaxy superimposed on the arc, and it is then possible to explain the enlargement of the arc eastwards this galaxy, where the spectrum was obtained (see Figure 2).

All the details of this model have been presented in a paper submitted to *Nature* in April (4), with a discussion of several other possible mechanisms able to create such a structure. In order to confirm or disprove the lensing hypothesis, we need to obtain the spectrum of the entire structure and to test whether the redshift of the light is z = 0.59 or not. We are waiting for this summer when the cluster will be observable again . . .

In the case of the other arc discovered in Cl 2242-02, actually both the redshifts of the cluster and of the arc are unknown so that it is not possible to model a lensing configuration. However, this cluster will be observable this summer too, and we can hope that these data will soon be available.

It should be noted that such a discovery is very important because if the lensing model is confirmed, it leads to the determination of masses in a very original way. For example, in the case of A 370, we are able to "measure" the mass crossed by the light along the line of sight, containing mainly the mass of the cluster core, with a good accurary:

$$M \sim 1 \text{ or } 2\ .10^{14}\ M_\odot$$

Moreover, the model can lead to the determination of the Mass-to-Light ratio in the cluster core ($M/L_R \sim 200$ in A 370) and inside the individual galaxies ($M/L_R \sim 20$). The existence of the dark matter can be confirmed without any physical assumptions such as the virial theorem, and it is possible to study the repartition of the dark matter in the universe.

References

(1) Paczinski, B.: 1987, *Nature* **325,** 572.
(2) Soucail, G., Fort, B., Mellier, Y., Picat, J.P.: 1987, *Astron. Astrophys.* **172,** L 14.
(3) Zwicky, F.: 1937, *Phys. Rev.* **51,** 290.
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Latest News about SN 1987 A

After a relatively rapid decline in brightness during the first half of June, the rate levelled off at about 0.01 mag/day in V after June 24. Radio emission at 22 GHz was detected on June 20–22 with the 13.7-m millimetre-wave antenna at Itapetinga, Brazil. The signal strength was 500 ± 70 mJy. From IUE observations it is seen that emission lines are developing in the ultraviolet spectral region. This would indicate that it is now possible to look inside the expanding shell. Infrared speckle observations at ESO appear to show a light echo; the size seems to be smaller than expected (June 29, 1987).