would seem to be the only feasible way of producing the image.

There remains for consideration the mechanism whereby the changes were produced in the linen cloth. In 1950 I irradiated a range of fibres and plastics, including several different cellulose fibres, in BEPO, a research reactor at the Atomic Energy Research Establishment at Harwell. At the time BEPO was being run at only 3MW, so that the temperatures were in the range 70°C to 90°C. That meant that I was obtaining radiation effects without the complication of heat effects. Cellulose fibres turned to the straw-yellow colour that has been described for the image of the Shroud. They became friable, and there were changes in their internal structure that could be detected by the means of X-ray diffraction.

In those experiments samples were irradiated in the presence and in the absence of air, over a period of time. Oxidation affected the results. The description of the image on the Shroud would seem to correspond with the results obtained from my experiments when using a more prolonged irradiation in the absence of air. This would be consistent with the formation of the image being almost instantaneous, when there would not be time for oxidation reactions to take place.

The gamma radiation which must have been emitted would also affect the linen cloth. Its range would include the whole of the cloth. The effects of radiation on cellulose fibres vary considerably according to the molecular structure of the fibre. (Chapter on the effects of Ionising Radiations on Polymeric Materials, by Kitty Little, in Photographic Techniques in scientific Research, Vol. 3, Academic Press 1978). With poor quality material one would expect degradation at comparatively low doses. With good quality material, although higher doses degrade it, lower doses act to enhance its stability and resistance to degradation – and it has been reported that the linen of the Shroud is in very good condition. This would be in accord with the rich Joseph of Arimathea buying the best available.

That much can be said with a reasonable degree of confidence. The particles would also be accompanied by neutron emission, but it is impossible to say at what intensity. There are several ways in which atomic disintegration could occur, and there is not sufficient data available to attempt to calculate the possibilities. The action of neutrons would result in the formation of extra-carbon-14 in the linen sheet – the whole of it, and not just in the area of the image. The extra carbon-14 would tend to make the

apparent age of the fabric appear to be more recent than it really is, but there would be no means of ascertaining the extent of the discrepancy. It could well be within the limits of experimental error.

One would not expect the amount of energy released to cause a violent explosion, but it would certainly make itself felt, and according to the Gospel (Matthew 28:2) the moment of the Resurrection was accompanied by a "great earthquake".

It would seem to have been less violent than the earthquake that occurred at the time of Christ's death, when "the veil of the Sanctuary was torn in two from top to bottom, the earth quaked, the rocks split, the tombs opened and the bodies of many people rose from the dead" (Matthew 17:51-52). In the case of the resurrection it was sufficient to displace the heavy stone at the mouth of the tomb, and to terrify the guards, but not to cause serious structural damage to the rock from which the tomb had been hewn. It seems to have been localised, and centred on the tomb, which would fit in with the cause being the energy released as the nuclei of the atoms in the body disintegrated. There is, of course, no natural way in which the nuclei of light elements could disintegrate in this manner. Such a happening would be strictly miraculous.

THE CARBON-14 "DATING" FIASCO

At intervals the question of carbon dating had come up. It is a fashionable technique, and many of the people concerned thought that it could provide definitive evidence of the date of manufacture of the Shroud.

When the Holy See took over custody of the Shroud a "scientific Commission" was appointed to advise on further investigations. It seems to have been just one man, a Luigi Gonella, who was apparently unacquainted with the requirements of genuine scientific methodology. An exasperated scientist has written of his attitude:

> "Not to believe in authenticity is 'scientific'. But to conclude that duly observed and measured phenomena must lead to a just and proportionate cause – the death, burial and resurrection of Our Lord Jesus Christ – is to be 'enthusiastic'."

When the decision was made that the carbon dating technique should be used Dr. Tite of the British Museum, was appointed to supervise the exercise. Previously it had been tentatively decided that seven laboratories, two with long term experience of carbon

dating, should participate. But these two and two others were dropped leaving three laboratories to take part, who were to use a new variation of the technique. These three were in Arizona, Oxford and Zurich.

In due course, the time came to take the specimen from this Shroud. According to the report in "Nature" by Dr. Tite and his colleagues:

> "All these operations, except for the wrapping of the samples in foil and their placing in containers, was fully documented by video film and photography."

But for the crucial stage in the programme, the placing of the samples in the containers and their labelling:

> "The samples were taken to the adjacent Sala Capitolare where they were wrapped in aluminium foil and subsequently sealed inside numbered stainless steel containers by the Archbishop and Dr. Tite".

No record has been kept of precisely what happened when these two men were out of sight of the rest of the people involved. It has since been said that they were joined by Gonella.

The ostensible reason for the failure to record the details of the placing of the samples in the containers was that it was to be a "double blind" experiment. That is, the laboratories taking part were not to be told which sample was which. There were meant to be two medieval specimens as controls, together with one from the 1st century. In practice the laboratories seem to have been told which specimen was "the Shroud".

The paper in "Nature", "Radio-carbon dating of the Shroud of Turin", April 1991 by the 21 people who took part in the investigation, gives 7 x 1 cm as the size of the strip cut from the Shroud. But the size given by the two men who actually cut and weighed the sample (watched by video cameras) was given at a Conference in September 1989 as 8.1 x 1.6 cm. Brother Bruno Bonnet-Eymard turned detective, and set out to interview all the people who had handled the specimens. Statements made to him about dimensions and weight were contradictory. It became apparent that there is no way in which this could be described as a carefully controlled experiment.

The "Nature" paper, when it finally appeared, about 18 months after the media campaign denouncing the Shroud as a "fake", was remarkably short of any relevant practical details. Instead its authors indulged in a "blinding with science" statistical exercise that few people would be able to follow – and which was

singularly unconvincing. It disregarded the fact that such small numbers are never amenable to statistical treatment. (I have noticed that the misuse of statistics is a common practice among those seeking to manipulate "results".) Also, for their approach to be scientifically valid, since they were dismissing as "false" a mass of previous evidence, they ought to have given, point by point, their reasons for doing so. They made no attempt to do this.

Measurements given by the three laboratories were of three medieval specimens and one early one. These were said to be the specimen from the Shroud and three controls. For the specimen said to be from the Shroud two of the three laboratories produced dates that would seem to be later than the time when the material was known to be in existence. The Oxford laboratory were unable to perform their measurements at the same time, because they were having problems with their instruments. Finally, a month later, they produced an answer giving an earlier date. It was only because of this that the average came into the "possible" range.

The results from the 1st century "control" specimen have also given rise to comment. It is said to be from the Cleopatra mummy, for which the British Museum dating range was given (in the paper) as 110BC to 75AD. Used as a control specimen the paper gives a "68% confidence level" as 11AD to 64AD, and the "95% confidence level" as 9BC to 78AD. It has been pointed out that these figures seem to fit the Shroud better than the mummy. (Cleopatra was born in 69BC and died in 30BC).

Taken together, the flaws in the procedure and in the subsequent reporting are sufficient to exclude Dr. Tite's carbon dating exercise from further consideration.

THE SIGNIFICANCE OF THE HOLY SHROUD

At the present time the Church is under very virulent attack by those who are seeking to set up a One World Dictatorship – the "New World order" – since to establish a lasting dictatorship these people consider that the eradication of Christianity is essential. Consequently it is now being attacked from almost every angle.

The Incarnation, Crucifixion, and Resurrection are at the heart of the Christian faith, and so the enemies of the Church are busy writing them off as either not miraculous or non-events. The propaganda varies, but in any case anything miraculous must be denied. Since it all happened almost two thousand years ago it seemed safe to say that accounts of miracles were merely the products of the imagination of contemporary writers. In support