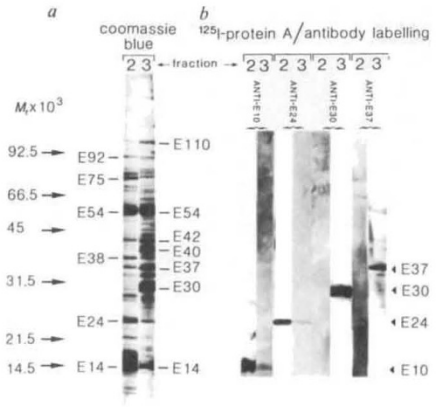

Electrophoretic and immunochemical analyses of envelope polypeptides in membrane fractions enriched in outer and inner envelope membranes from spinach chloroplasts (Fig. 3 from ref. 4). *a*, coomassie blue staining of envelope polypeptides separated by SDS-PAGE with a 7.5–15 per cent acrylamide gradient; *b*, autoradiography of antigen–antibody ^{125}I-protein A complexes after electrophoretic transfer to nitrocellulose sheets. Fractions 2 and 3 correspond to membrane fractions enriched in outer and inner envelope membranes, respectively. Antibodies to E10 and E24 are against outer envelope membrane proteins, whereas antibodies to E30 and E37 are to inner envelope membrane proteins; E30 is the phosphate translocator.

outer and the inner envelope membranes. For instance, this fraction was used by Cline *et al.*[3] as a source of both outer and inner membranes for further separation of each membrane. Unfortunately, Pain *et al.* did not investigate whether their membrane fraction contained only the outer-envelope or both envelope membranes. The presence of bound pS in this fraction was expected but this does not exclude the possibility that some inner membrane (and therefore some phosphate translocator) is also present. To identify the receptor, the authors cite as evidence: (1) that a major 30K polypeptide exists in envelope membranes after silver-staining (their Fig. 6*a*); (2) that this protein is also the major iodinated polypeptide of the envelope fraction (their Fig. 6*c*); and (3) that this protein precipitated in presence of the antibody (their Fig. 6*c*). The only integral envelope membrane protein following the first two criteria is indeed the phosphate translocator, which is the major protein in the inner envelope membrane (see figure). There is as yet no proof that the import protein is a major envelope component. Because the antibody is able to immunoprecipitate major components of the fractions analysed (their Fig. 5), one can question whether the major protein immunoprecipitated in their Fig. 6*c* is indeed the import receptor. We believe that the most likely candidates are the minor bands indicated by asterisks in Fig. 6*c* or a minor protein which coprecipitates with the phosphate translocator.

We believe that more work is needed before it can be concluded that the import receptor of the chloroplast envelope is a major 30K integral membrane protein. Envelope membranes contain many different proteins involved in the biosynthesis of typical plastid components (such as galactolipids, phosphatidylglycerol, prenylquinones) and in the exchange of metabolites between the cytosol and the stroma. Only a few of these proteins have been identified. The main reason for this is that large amounts of envelope membranes have to be purified from chloroplasts, a difficult procedure.

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PAIN AND BLOBEL REPLY —We agree with Joyard and Douce that a chloroplast fraction, when analysed by SDS-PAGE, yields a major 30K band which at high resolution consists of several polypeptides and that more work will be necessary to definitively establish which of these is the import receptor.

Since publication of our paper[1], we have prepared rabbit antibodies against this major 30K band excised from an SDS gel. These antibodies are able to agglutinate intact chloroplasts and, like our anti-idiotypic antibodies, yield distinct immunofluorescent staining in patches in the periphery of chloroplasts. Moreover, monovalent F_{ab} fragments of these antibodies inhibit import. These data, which are yet to be published, thus provide additional support for our previous conclusion that a 30K polypeptide of the chloroplast envelope that we found to be immunoreactive with the described anti-idiotypic antibodies is likely to be the import receptor (or part of it).

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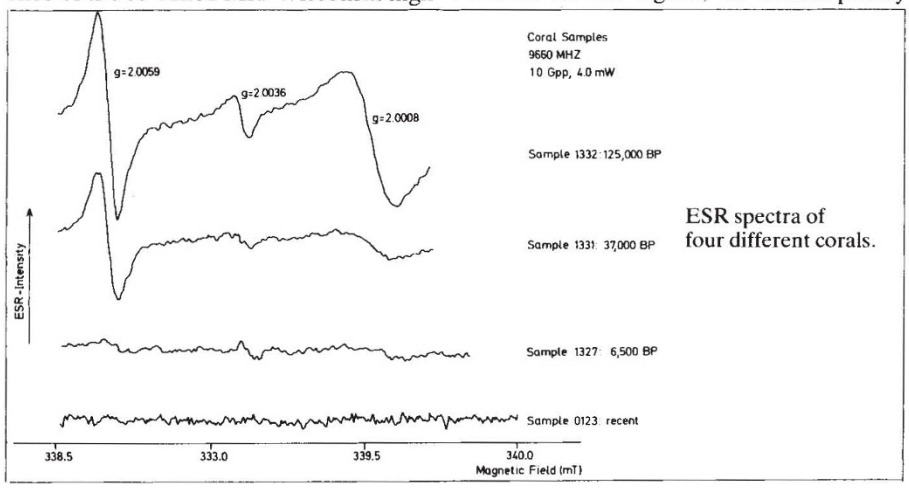
How to avoid 'useless' radiocarbon dating

SIR—I wish to propose a quick and inexpensive method of screening samples to determine their suitability for radiocarbon dating. This would reduce the large amount of money that is wasted by dating samples that in fact lie either completely beyond the limit of ^{14}C dating, or within the 'critical range' of 20,000–50,000 years before present (BP) in which ^{14}C dating is possible but inaccurate.

For example, 51 of the 272 shell and coral ^{14}C datings published in 1983 in volume 25(3) of the journal *Radiocarbon* were 'useless'. Assuming an average cost of $250 for each dating, this represents a waste of $12,750 of research funds that could have been spent more fruitfully. Pre-screening would also help to avoid controversies such as that about the existence of the so-called Mid-Wisconsin high-level (~35,000 yr BP) which is based solely on the misinterpretation of ^{14}C dates.

In many cases, the stratigraphical context of a particular sample does not make it clear whether or not the sample lies within the optimal ^{14}C dating range. I suggest that samples are screened for their approximate age range by means of electron spin resonance (ESR) which can date various paramagnetic materials such as quartz, calcite, aragonite, feldspar and zircon[1].

Unfortunately, the material analysed most frequently by ^{14}C dating — charcoal — is unsuitable for ESR dating, but shells and corals are common examples of suitable calcitic and aragonitic material. In aragonitic fossils there are three important ESR signals that increase with time[2,3]. As shown in the figure, in contemporary



ESR spectra of four different corals.