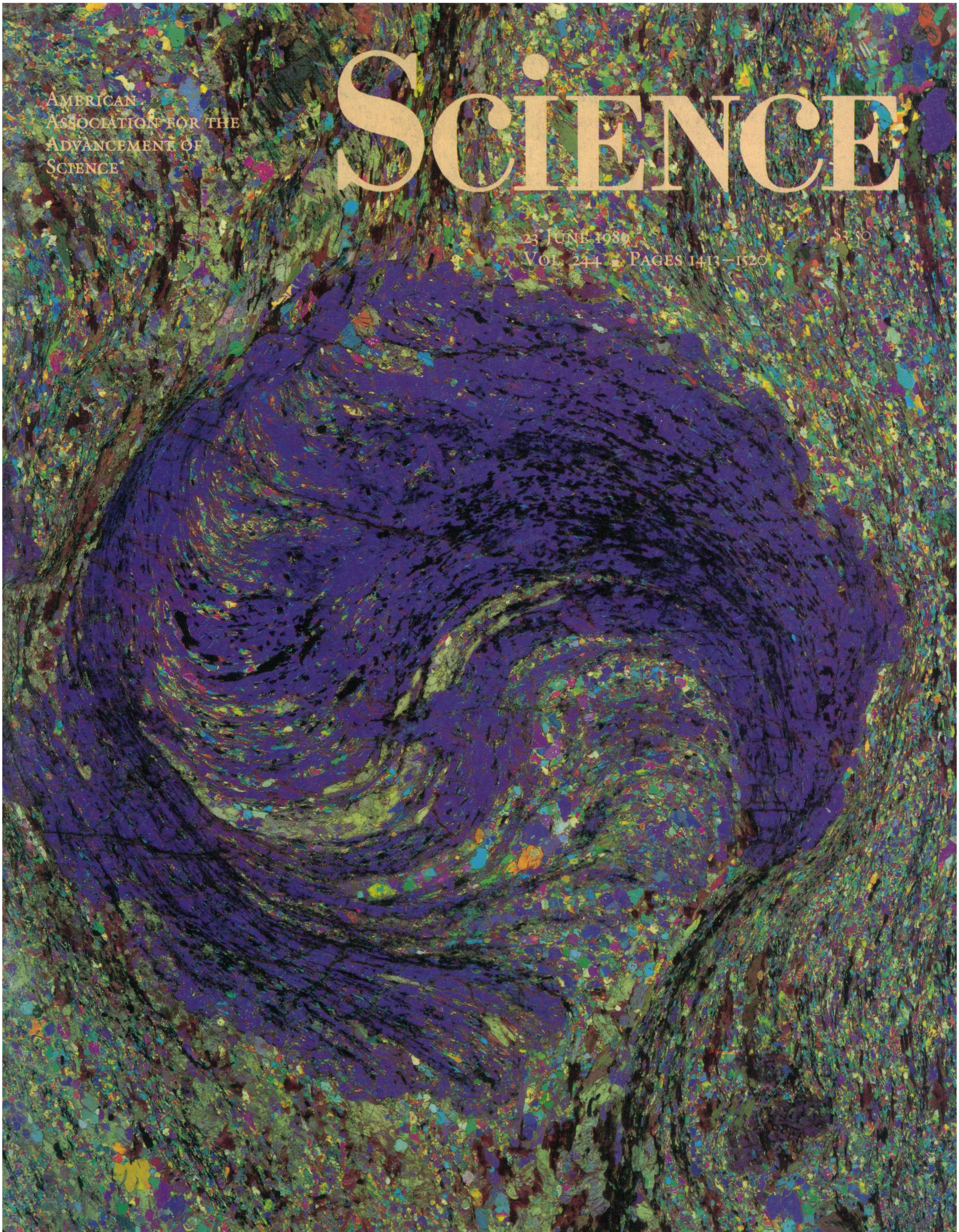

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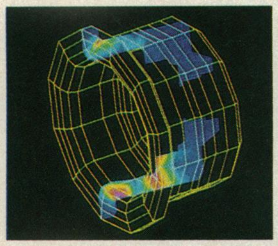

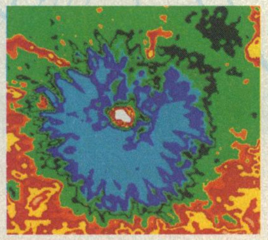

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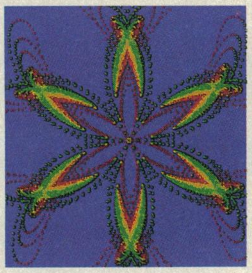

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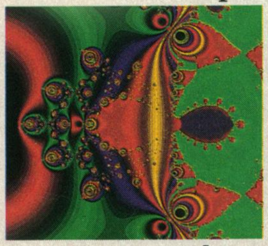

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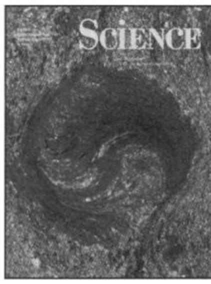

COVER Thin section of a 2-centimeter garnet that rotated as it overgrew mineral grains in a deforming schist matrix. View is northerly on steeply dipping west limb of a large anticline in southeastern Vermont. Rubidium-strontium isotopic measurements on similar garnets nearby yield the growth rate of the garnets and therefore the deformation rate of the matrix. See page 1465. [Positive by Colortek, Culver City, CA, directly from this section and 575-nanometer retarder sandwiched between crossed Polaroids]

Book Reviews

Products & Materials

Search for exotic particles

MASSIVE, negatively charged particles may have been among the elemental entities that formed in the Big Bang (page 1450). So far, however, these so-called X^- particles have remained elusive: no attempts to find them or to generate them through high-energy interactions have succeeded. Were they really produced and if so can they now be detected as embedded components of chemical elements? Boyd *et al.* consider where 10 billion years of chemical evolution (the time from the Big Bang to the formation of the earth) might have left the X^- particles. They propose to search with laser spectroscopy for X^- particles in diatomic molecules containing elements with certain masses (the best being boron and fluorine). Interactions of X^- particles with nuclei would be electromagnetic. The discovery of X^- particles would have implications for particle theories, for explanations of how the chemical elements of the periodic table formed, and for models of the evolution of the galaxy.

Garnet growth

GARNETS are common minerals in metamorphic rocks; because garnets grow during metamorphism (the pressure- and temperature-induced changes in rocks that often are associated with tectonic and deformation events), they contain a record of the physical conditions that pertained during their growth. Through a study of the strontium (Sr) and rubidium isotopes in garnets and of how ^{87}Sr increases from the core to the rim in individual samples, it has been possible to determine the length of time the garnet was growing, the rate at which it grew, and approximately when it grew (page 1465). Christensen *et al.* analyzed three large garnets from southeastern Vermont. The garnets formed some 380 million years ago during an episode of deformation and metamorphism that produced part of the Appalachian Mountains. The garnets formed during a 10.5-million-year period, and their rate of growth was calculated at 1.4 millimeters per million years. The growth interval provides a means for estimating the rate at which the rocks were deformed and heated.

Ubiquitin actions

UBIQUITIN, so called because it is ubiquitous, binds to proteins inside cells and marks them for degradation; various enzyme activities occur, the protein is broken down, and the ubiquitin is released. Previous studies indicated that proteins with free amino-terminal residues could be degraded in this way but that those in which the amino terminus was blocked with an acetyl group could not. However, Mayer *et al.* show that this is not the case; both blocked and unblocked proteins can be degraded by the ubiquitin system (page 1480). There appears to be a conjugating enzyme that links ubiquitin to the blocked proteins at a site distinct from the amino-terminal residue; it may have been lost during purification of preparations that were used in earlier studies. The majority of cellular proteins are blocked at their amino termini, and thus the ubiquitin system, which is involved in their turnover, appears to play an important role in normal cell physiology.

Streptococcal immunity

GROUP A streptococci can cause painful sore throats, "strep throat." There are 25 to 35 million cases of streptococcal infections diagnosed each year in the United States. If the infection is not effectively treated, rheumatic fever, which has become a significant problem in developing countries, can result. What makes these streptococci so virulent is their surface M protein. The M protein consists of a conserved end and a variable end. Hosts that resist infection produce antibodies to the variable end, but the tremendous variability in it (some 80 different variable ends have been identified) makes it unlikely that a vaccine could be made using variable end determinants. Fischetti *et al.* have prepared a recombinant vaccine in which the conserved end of the M protein was expressed in a vaccinia virus vector (page 1487). Mice were immunized intranasally with this vaccine and subsequently resisted a challenge infection with streptococci; they made antibodies to the conserved region, and throat swabs indicated that the bacteria were then unable to colonize the pharynxes. The approach of using a conserved region of a protein to provide cross-protection against related strains may have broad applicability for pathogens besides the group A streptococci.

Plants for pest control

OBSERVATIONS of the distribution and survival of aphids on cottonwood trees in northern Utah may have important spin-offs for pest management (page 1490). Female aphids attack the tree's developing leaves in springtime. If the attack is successful, galls form on the leaves, and, inside the galls, hundreds of progeny are produced. If the attack is unsuccessful, a telling scar remains on the leaf. Surveys of galls and scars indicated that most of the aphids—from 85 to 100%—attacked and formed galls on hybrid cottonwood trees rather than on the two pure species of which the hybrids are a mixture, even though one of these is a natural host of the aphid. Only 3% of all the trees were hybrids, but the preference of the aphids for the hybrids remained firm year after year. Whitham suggests that, by providing the aphids with a ready and highly susceptible host, the hybrid trees act as "ecological sinks"; furthermore, because the aphids are not adapting to survival on the more resistant pure hosts, the hybrids may be impeding evolution and thus are serving as "evolutionary sinks" as well. One form of aphid control might therefore involve the use of small numbers of aphid-supporting hybrids on which these pests can live.

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Synthetic Membranes

The level of R&D activity devoted to synthetic membranes has risen rapidly during the past several years. Great progress is being made both in separative capabilities and in the scope of practical applications.* The trend is especially marked in the field of gas separations, in which at least 20 major companies worldwide are now active. Their membranes are being used in a host of important processes ranging from food preservation to natural-gas processing, refinery operations, and enhanced oil recovery.

A key event in the technology of gas separative membranes was the development by Monsanto of a method of producing tiny hollow polymer fibers, first used practically in 1979. Gases under pressure dissolve in the fiber walls and diffuse through the membrane at different rates. For example, the rates for methane and nitrogen are low, whereas those for moisture, oxygen, carbon dioxide, and hydrogen sulfide are rapid. There is an interesting contrast between barriers that have open tiny holes and those that present a continuous wall. The separation through a barrier with small holes is dependent on the ratio of the square roots of the masses. Thus the separation factor of nitrogen and oxygen is only about 1.07 through the holes, whereas some of the synthetic membranes have a separation factor of more than 7. The synthetic membranes are usually composed of such polymers as cellulosic derivatives, polysulfone, polyamide, or polyimide. The structure of the polymer chain has a dramatic effect on separating characteristics. Bulky side groups create excess free volume within the wall. Moreover, large improvements in separative capabilities are being achieved by altering polymer formulations. Between 1985 and 1988, separative capabilities were increased from 200 to 400%. A recent product announcement by Generon, a subsidiary of the Dow Chemical Company, indicates further substantial progress.

In many instances membrane technology is in competition with existing methods. For example, cryogenic equipment for separations of gases is well established. However, in comparison to other methods membrane equipment often has low capital costs, ease of operation, low energy consumption, operational cost effectiveness, and good weight and space efficiency.

Membranes alone cannot achieve perfect separation of gases, for example, nitrogen from the oxygen of air. However, in one pass through the fibers, the gas is changed from 21% oxygen to a gas containing 2 to 5% oxygen or less. This product is excellent for many applications such as preservation of fruit and grain and for safely blanketing highly inflammable liquids. In grain elevators, a low oxygen content safeguards the grain against rodents and other pests while eliminating danger of dust explosions. Fruit can be maintained in excellent condition much longer in the presence of a low oxygen content than with ordinary air present. At locations distant from a cryogenic plant membrane separation is the simplest, most cost-effective method of achieving the low oxygen content.

Installations of gas separative membranes are increasingly occurring in energy production activities. An initial application was to isolate hydrogen from other components in refinery streams. What may become more important is the processing of gas mixtures that contain methane, moisture, carbon dioxide, and hydrogen sulfide. Such mixtures are present in much of petroleum production, non-associated natural gases, and gas produced in connection with enhanced oil recovery attained through injection of carbon dioxide. Some natural gas contains a quite toxic level of hydrogen sulfide. Both this compound and carbon dioxide are corrosive to pipes, and their level and that of water must be reduced before injection into major pipelines. In the past, many discoveries of natural gas were capped because of excessive content of non-methane gases. Cheaper membrane technology is changing the economics. Carbon dioxide has become valuable in enhanced oil recovery so that gases that were worthless now have two useful components—carbon dioxide and methane. Another situation in which membrane technology is especially helpful is in offshore production of petroleum with its associated gases. The older technology for cleaning the gases is heavy, cumbersome, space demanding, and not entirely free of hazard. Membrane separation is preferable in many instances.

Prospects are excellent for further improvements in the selectivity and performance of membranes and for their energy and cost-effective use in a growing number of large-scale applications.—PHILIP H. ABELSON

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Synthetic peptides V(H)(27-68) and V(H)(16-68) of the myeloma immunoglobulin M603 heavy chain and their association with the natural light

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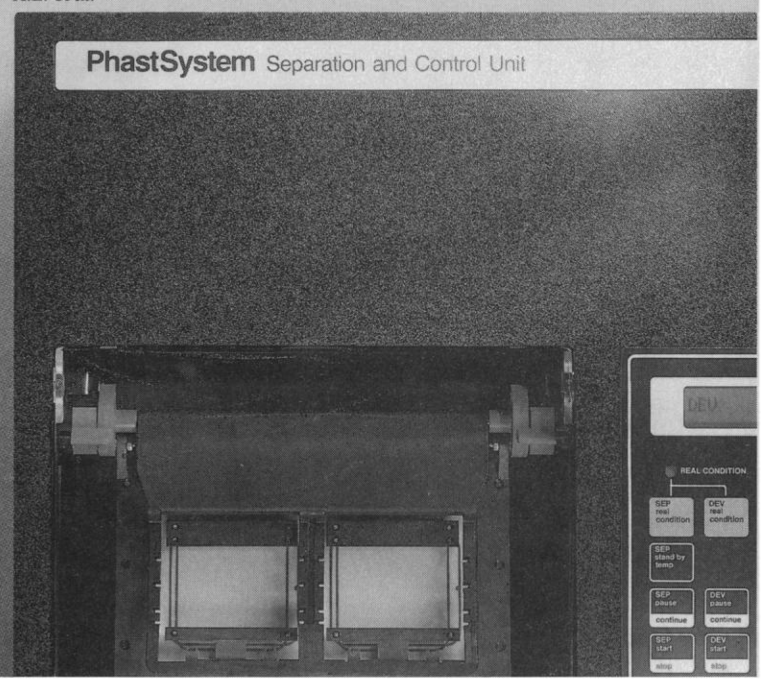

dence in the accuracy and reproducibility of PhastSystem results. Confidence in the efficiency and speed of PhastSystem. In January 1988, the Journal of Electrophoresis devoted an entire issue to articles on PhastSystem methods. Recently, forensic results obtained on PhastSystem have been accepted as valid court evidence.

The list of references continues to grow. And so does the commitment from Pharmacia. Since PhastSystem was introduced, several new gels and a silver staining kit have added to the versatility and reproducibility of the original system. Many new application notes and technical files have been published.

PhastSystem owners throughout the world regularly receive a newsletter that keeps them informed on the latest additions to the system, new applications, valuable method tips and updated reference lists. Over a hundred workshops and seminars have been conducted to date on PhastSystem techniques. And within the next few months several new gels and major accessories to PhastSystem will be introduced worldwide.

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In vivo cell labeling grade L-[^{35}S]Methionine

Time course of incorporation of *in vivo* cell labeling grade L-[^{35}S]Methionine (SJ.1015) in 3T3 mouse fibroblasts.

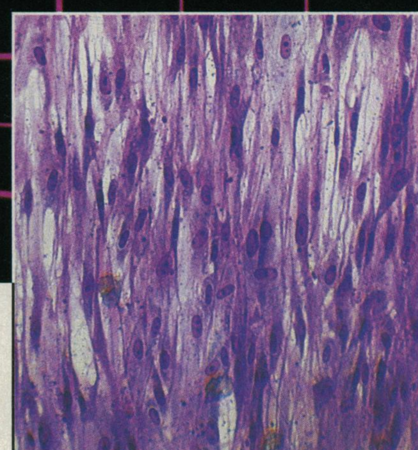
Now you can perform *in vivo* cell labeling more efficiently with Amersham's stabilized L-[^{35}S]Methionine (Cat. No. SJ1015). It features:

- No cytopathic effects from Amersham's exclusive stabilizer; assured compatibility with tissue culture systems.
- The highest specific activity—1000-1300 Ci/mmol—for better detection.
- Reduced formation of volatiles for safer handling, a result of HPLC purification and stabilization.
- Decomposition rate is less than 3% per month.

Amersham offers a comprehensive line of other high-purity L-[^{35}S]Methionines:

- SJ204—in potassium acetate, no stabilizer added.
- SJ235—aqueous solution, free of salts.
- SJ1515—stabilized, used in cell-free systems.
- SJ5050—stabilized, high concentration.

For more information on L-[^{35}S]Methionine for *in vivo* cell labeling as well as Amersham's other L-[^{35}S]Methionines, just write or call us toll free today.



Cytotoxicity testing of radiochemical stabilizers in MRC-5 human fibroblasts, grown in petri dishes, treated with Pyridine, 3,4-discarboxylic acid* and fixed using 3% formaldehyde in phosphate-buffered saline and Giemsa stained. *Patent applied for.

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