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**MACRO
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The macro column is off to a good start. Readers are commenting on published macros as well as sending in descriptions of problems they have encountered. However, no one has yet submitted solutions to posed questions ...

Errata

There are two minor corrections to macros published in TUGboat, Vol. 2, No. 2.

(1) Mike Spivak notes a subtle error in McKay's definitions for \uparrow and \downarrow . Since the macros classify these characters as type 13, spaces after them are not ignored, even in math mode. As a result

$$2\uparrow x$$

gives

$$2x$$

because the superscript is the space. For *AMS-TEX*, Mike has fixed this problem by having \uparrow first check whether #1 is a space, using `\compare* {#1}`.

(2) When used in horizontal mode, Patrick Milligan's `\Apply` macro may cause extra space to be inserted. The carriage return after the opening left brace, and the space after #1 in the redefinition of `\Func` are significant.

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TUGBOAT MACRO INDEX

The following list catalogues macros that have appeared in earlier issues of TUGboat. Entries are listed by volume, number, and page as well as author's name. Items that could not be categorized by an obvious headword have been listed under "miscellaneous". Many items refer to parts of large macro packages; users of other packages may find them valuable models for macros of their own.

Readers' comments on the format as well as the contents of this index are welcome.

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BUBBLES: A T_EX EXTENSION IN SEARCH OF A T_EXPERT

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Preamble

The bubble notation used in particle physics is identical in format with a notation for tensors to the relativist Roger Penrose. This "language" is strictly formalised, with the possible diagrams governed by a few simple rules. In effect, a diagram consists of a number of "boxes", joined together by lines. A T_EX extension is proposed, in which Penrose or bubble diagrams can be displayed in exactly the same way as mathematical formulae.

Analysis of the notation

There are 2 elements in the diagrams.

First, there are the tensors or bubbles. Each of these consists of a "container" of some kind, usually a rectangle or a circle. Inside there may be an identifying name or symbol.

Emerging from the perimeters of these containers are the second element of the diagrams, the arms. An arm may join 2 tensors; or it may extend to the edge of the diagram.

The relative positions of the arms on a tensor are significant, e.g. if the tensor T is represented by a rectangle, with 2 upper arms and 1 lower, then the left upper arm must be distinguished from the right upper arm; and both are quite different from the lower arm.

(If only that sought-for T_EXpert could tell me how to replace this pedantic description of a box by a magical control sequence ... !)

Meaning of the Penrose notation

Although not strictly necessary, it may help me to explain, very briefly, the interpretation of the Penrose notation for tensors.

In the classical (Einstein) notation, a tensor of type (1, 2) (for example) is denoted by

$$T^i_{jk}$$

Here i , j and k are "dummy suffixes", so that

$$T^a_{bc}$$

represents exactly the same tensor.

In the Penrose notation, T is incarcerated in a box, with 1 upper arm (corresponding to the upper index i) rising from the top of the box, and 2 lower arms (corresponding to the lower indices j and k) descending from the bottom of the box.

The joining of arms on 2 tensors (or on the same tensor) in a Penrose diagram corresponds to the contraction of the corresponding indices—denoted