degenerate case is not included among the simple Lie groups by the mathematicians. O(3) is just the 3-dimensional rotation group and we know that is essentially the same as the isotopic spin group SU_2. The four-dimensional rotation group O(4) is not simple; it is equivalent to the direct product O(3) x O(3). The groups O(5) and O(6) are omitted because they are essentially the same as Sp(2) (see below) and SU(4) respectively. Thus we begin with O(7). The dimension n of the algebra of $O(\nu)$ is just the number of infinitesimal rotations $\frac{\nu(\nu-1)}{2}$. In fact, the infinitesimal $\nu \times \nu$ rotation matrices (imaginary and antisymmetric) form an irreducible matrix representation of the algebra of the group.

c) The third infinite sequence of simple Lie groups is that of the symplectic groups $Sp(\nu/2)$ with $\nu = 4,6,8,10,12,\ldots$. The algebra of the infinitesimal elements of $Sp(\nu/2)$ is just the algebra of the $\nu \times \nu$ skew-symplectic matrices[5]. Again we have a natural $\nu \times \nu$ irreducible matrix representation of the algebra. We note that Sp(1) is omitted because it is the same as SU(2).

d) Finally, there are five more simple Lie groups and the corresponding Lie algebras. These are called exceptional Lie algebras and their names and dimensions are as follows: G_2 -- 14, F_4 -- 52, E_6 -- 78, E_7 -- 133, E_8 -- 240.

In our listing, we have really defined each of the simple Lie algebras (except the exceptional ones, for which the same can be done) by exhibiting one of its matrix representations. In each case, we