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L-Brane — A *p-brane* which has *worldvolume* supermultiplets with higher rank non-self-dual *tensor gauge fields* which are usually referred to as linear multiplets [1]. There are two sequences of **L-branes**: the first has as its members a 5-brane in $D=9$, a 4-brane in $D=8$ and a 3-brane in $D=7$ which all have eight *worldvolume* supersymmetries, while the second has only one member, the 3-brane in $D=5$ which has four *worldvolume* supersymmetries [2]. The 3 and 4-branes of the first sequence can be obtained by double **dimensional reduction** from the first member of the sequence, namely the 5-brane in $D=9$, and the latter can be interpreted as arising as a vertical reduction of the geometrical sector of the *heterotic/type I* 5-brane, followed by the dualisation of the scalar field in the compactified direction. By the geometrical sector we mean the sector containing the *worldvolume* fields corresponding to the breaking of supertranslations. The relevant *target space field theory* in this context is the **dimensional reduction** of the dual formulation of $N=1, D=10$ supergravity followed by a truncation of a *vector multiplet*. The L5-brane is expected to arise as a soliton in this theory [1]. A feature of **L-branes** is that their *worldvolume* multiplets are *off-shell multiplets* in contrast to many of the branes that have been studied previously such as *M-branes* and *D-branes*. The standard *embedding* constraint does not lead to the dynamics of **L-branes** and imposing the **Bianchi identity** for the *worldvolume tensor gauge field* does not change the situation. As a consequence the equations of motion of such branes have to be determined by other means, either by directly imposing an additional constraint in superspace or by using the brane action principle which has the advantage of generating the modified *Born-Infeld term* for the tensor **gauge fields** in a systematic way [1].

Bibliography

[1] P. S. Howe, O. Raetzel, E. Sezgin, J. High Energy Phys. **9808** (1998) 01; P. S. Howe, O. Raetzel, I. Rudychev, E. Sezgin, Class. Quant. Grav. 16 (1999) 705.

[2] P. S. Howe, E. Sezgin, Phys. Lett. **B390** (1997) 133.

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Landau-Ginzburg Models — The action for a super Landau Ginzburg model of n chiral **superfields** Φ_i $(i=1,\ldots,n)$ with **superpotential** $W(\Phi)$ is given by

$$S=\int \mathrm{d}^2x\left[\int \mathrm{d}^4\theta\, K(\Phi_i,\overline{\Phi}_i) + \frac{1}{2}\left(\int \mathrm{d}^2\theta\, W(\Phi_i)+\int \mathrm{d}^2\bar{\theta}\,\overline{W}(\overline{\Phi}_i)\right)\right],$$

where $K(\Phi_i,\bar{\Phi}_i)$ is the *Kähler potential* which defines the Kähler metric $g_{i\bar{j}}=\partial_i\partial_{\bar{j}}K(\Phi_i,\bar{\Phi}_i)$. If the **superpotential** $W(\Phi)$ is a quasi-homogeneous function with an isolated critical point (which means $dW=0$ can only occur at $\Phi_i=0$) then the above action for a particular choice of $K(\Phi,\bar{\Phi})$ defines a *superconformal theory* (see [1] where the classification of **Landau–Ginzburg models** was done). For a general **superpotential** the vacua are labeled by critical points of W, i.e., where

$$\phi^i(x)=\phi^i_*,\quad \partial_i W|_{\phi^i_*}=0.$$

The theory is purely massive if all the critical points are isolated and non-degenerate, which means that near the critical points W is quadratic in fields. We assume this and label the non-degenerate critical points as $\{\phi_a \,|\, a=1,\ldots,N\}$. In such a case the number of vacua of the theory is equal to the dimension of the local ring of $W(\Phi)$. If there is more than one vacuum one can have solitonic states in which the *boundary conditions* of the fields at the left spatial infinity $x^1=-\infty$ is at one vacuum and is different from the one at right infinity $x^1=+\infty$ which is in another vacuum. The geometry of solitons and their degeneracies have been studied in [2]. Solitons are static solutions, $\phi^i(x^1)$, of the equations of motion interpolating between different vacua i.e., $\phi^i(-\infty)=\phi^i_a$ and $\phi^i(+\infty)=\phi^i_b$, $a\neq b$. The energy of a static field configuration interpolating between two vacua is given by [3]