

Dec 1 THF

A map  $\text{Spec } R \rightarrow \text{Spec } R_1$  corresponds to an elliptic curve  $J$  over  $R_1$ .

$$\begin{array}{c} \downarrow J \\ \mathcal{M}_{\text{ell}} \end{array}$$

Map between elliptic curves

$$\begin{array}{ccc} \text{Spec } S & \xrightarrow{\quad} & \text{Spec } R_2 \\ \downarrow & \searrow & \downarrow J_2 \\ \text{Spec } R_1 & \xrightarrow{J_1} & \mathcal{M}_{\text{ell}} \end{array}$$

to give a map  $R_2 \rightarrow S$  is the same as

$$\begin{array}{ccc} R_1 & \xrightarrow{f_1} & S \\ R_2 & \xrightarrow{f_2} & \end{array}$$

$$f_1^* J_1 \cong f_2^* J_2$$

$$\text{Spec } S \rightarrow \text{Spec } R_1$$

$\text{Aff}/\mathcal{M}_{\text{ell}}$

$$\text{ob } \text{Spec } R_1 \rightarrow \mathcal{M}_{\text{ell}}$$

$$\text{map } \text{Spec } R_2 \rightarrow \text{Spec } R_1$$

$$\text{Spec } R_1 \rightarrow \mathcal{M}_{\text{ell}}$$

This is true for any stack

(don't use property about elliptic curves)

CONCRETE WAY TO DESCRIBE THIS CATEGORY

i.e.  $\text{ob } (R, J) \quad J = \text{ell. curve over } R$

$$\text{map } (R_2, J_2) \rightarrow (R_1, J_1)$$

$$R_2 \xrightarrow{f} R_1 + \text{iso } f^* J_2 \cong J_1$$

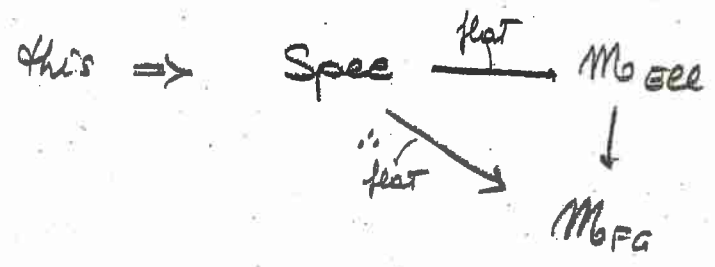
Fact:

- $\mathcal{M}_{0, \text{ell}} \rightarrow \mathcal{M}_{0, \text{FG}}$  is flat
- $\mathcal{M}_{0, \text{Weier}} \rightarrow \mathcal{M}_{0, \text{FG}}$  is not flat

$y^3 = x^3$  is the bad point

But removing it,

- $\mathcal{M}_{0, \text{Weier}} \setminus \{y^3 = x^3\} \rightarrow \mathcal{M}_{0, \text{FG}}$  is flat



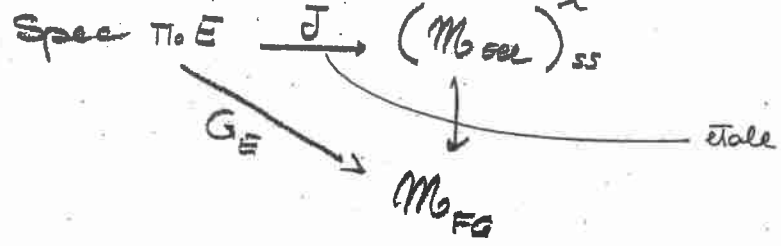
$\leadsto$  Landweber exact homology theories

Let

$\mathcal{C}_{\text{Top}}^{\text{ss}}$  super singular  
the category with  
topological

objects:

$A_{\infty}$ , even, periodic  $E$  together with one elliptic curve



maps:

$A_{\infty} : E_2 \xrightarrow{f} E_1$   
 + an iso  $(\pi_0 f)^* J_2 \sim J_1$  of elliptic curves.