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t-MOTIVES

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§0. Introduction. The goal of this paper is to answer two questions about Drinfeld's elliptic A-modules [1] and certain higher-dimensional generalizations, questions raised in an exchange of correspondence [3, 2] between B. Gross and V. G. Drinfeld. In this introduction we shall explain the questions and in very general terms the nature of our attack upon them.

A brief preliminary discussion of elliptic A-modules, and their description in terms of "lattices" and in terms of "shtukas" is called for. Let X be a smooth projective curve defined over a finite field of characteristic p, ∞ a closed point of X and set

$$A \stackrel{\text{def}}{=} \Gamma(X \sim \infty, \mathcal{O}_X).$$

Let k denote the fraction field of A, k_∞ the completion of k at ∞ and set

$$\tau \stackrel{\text{def}}{=} (x \mapsto x^p) \in \operatorname{End}_{\mathsf{F}_p}(\mathsf{G}_a),$$

the Frobenius endomorphism of G_a over F_p. An *elliptic A-module* (defined over $\bar{k}_\infty$) is a ring homomorphism φ: $A \to \operatorname{End}_{\bar{k}_\infty}(\mathsf{G}_a)$ such that for a suitable positive integer n and all $a \in A$, $a \neq 0$,

$$\varphi(a) = a + \sum_{0<j\leqslant nd|v_\infty(a)|} \varphi(a)_j \tau^j,$$

$$\varphi(a)_{nd|v_\infty(a)|} \neq 0,$$

where

$$d \stackrel{\text{def}}{=} \text{the degree of the residue field of the closed point } \infty \text{ over } \mathsf{F}_p,$$

$$v_\infty(a) \stackrel{\text{def}}{=} \text{the order of vanishing of } a \text{ at } \infty,$$

and for any $f \in \operatorname{End}_{\bar{k}_\infty}(\mathsf{G}_a)$, we expand f in powers of τ thus:

$$f = \sum_{j\geqslant 0} f_j \tau^j, \qquad f_j \in \bar{k}_\infty, \qquad f_j = 0 \quad \text{for } j \gg 0.$$

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