Mirror quintic

$$X / \mathbb{Z}_5^3$$

contains various 2-cycles

PF-operator $\quad PF \int_\gamma \omega = 0$

open string states $\tilde{\gamma}$

$$PF \int_{\tilde{\gamma}} \omega \neq 0.$$

$$PF \int_{\tilde{\gamma}} \omega \in \text{finite extension of } \mathbb{Q}.$$

Morrison-Walcher (2007)

2-cycle of these $C_+ - C_-$

$$PF \int_{C_+ - C_-} \omega \in \text{quadratic ext of } \mathbb{Q}$$

$\hookrightarrow$ a deformation of mirror cycles

= SLAG on mirror CY 3-fold.

(Bryant's construction)

Re(quintic) $\subseteq$ quintic   mirror

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van Geemen lines

(Albano–Katz)

Δ-family of lines on mirror quintic

$$x_1^5 + x_2^5 + \dots + x_5^5 - 5\psi x_1 \cdots x_5 = 0$$

Imposing relations $x_i = \lambda x_j$

$$\mathrm{PF} \int_{C_1 - C_2} \omega \in \text{cubic extension of Ch.}$$

Extended the PF question to

(periods of 3-tori) $\longrightarrow \mathbb{C}$.

Chow groups, or higher Chow groups

$$Ch(\bar{X}) \xrightarrow{PF} \text{target of higher Chow groups.}$$

(regulators in K-theory).

Calculus involving quantities which appear in construction of hyperbolic 3-manifolds.

(Neumann-Zagier) — hyperbolic volumes are determined by these calculations.

What mirrors could there be?

SLAG cycles in quantum

$$\Lambda^3 \subseteq X^6$$

Conjecture: $\mathrm{vol}(\Lambda^3) =$ Neumann-Zagier volume

associated to the PF calculation

of the mirror cycle