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Non-existence of some canonical constructions on connections

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Abstract: For a vector bundle functor $H : \mathcal{M}f \to \mathcal{VB}$ with the point property we prove that H is product preserving if and only if for any m and n there is an $\mathcal{FM}_{m,n}$-natural operator D transforming connections Γ on (m,n)-dimensional fibered manifolds $p : Y \to M$ into connections $D(\Gamma)$ on $Hp : HY \to HM$. For a bundle functor $E : \mathcal{FM}_{m,n} \to \mathcal{FM}$ with some weak conditions we prove non-existence of $\mathcal{FM}_{m,n}$-natural operators D transforming connections Γ on (m,n)-dimensional fibered manifolds $Y \to M$ into connections $D(\Gamma)$ on $EY \to M$.

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