

Contents 1993

1993-1

January 2: Relating cohomology groups of the mapping complex $H^k(\text{Hom}(C, C'))$, with cup product, to bivariant groups defined from H^0 , with cup product. Scinded fibred categories.

January 14: Observations coming from work on bivariant cyclic cohomology $HC^*(M, M')$, with cup product.

January 18: List of ideas for a future program of constructing homotopy equivalences using connections.

February 9: Operators T satisfying a polynomial relation $(fg)(T) = 0$ and contracting homotopies.

March 18: Note on the structure on $X(R)$: $\mu(x \otimes y) = xy$, $\nu(x \otimes y) = \natural(xdy)$ such that $b\nu(x \otimes y) = \mu(x \otimes y) - \mu(y \otimes x)$, $d\mu(x \otimes y) = \nu(x \otimes y) - \nu(y \otimes x)$.

April 9,10: On Karoubi's operator on unnormalized cochains. The normalization theorem for the Hochschild complex and contracting homotopies.

April 15,17: About Connes B_0 (revision of part 2 of a paper). Equivalence of the Getzler-Szenes and Connes definitions for entire cyclic cohomology.

May 7: Link between simplicial normalization and special contractions in the sense of HPT.

May 8: Representing classes in $\text{Ext}_A^n(M, N) = H^*(A, \text{Hom}(M, N))$ by Hochschild cocycles.

May 14,15: Cuntz's application to Nistor's bivariant Chern character.

May 18: Calculating $\text{gr}_I R = \bigoplus_p I^p / I^{p+1}$ where $R = A * \mathbb{C}[h]$, $I = Rh^2R$.

May 19,20: Review $R = A * \mathbb{C}[D]$, $D = 1 \otimes 1$ and $R = T_A(A \otimes A)$.

May 21,22: On a mixed complex M such that $H^b H^B M = 0$.

May 23: On the complex (C, b') with contraction h .

May 25: Calculations for an module M with submodules K, L such that $K \cap L = 0$.

May 26: Review mixed complexes satisfying Connes's Lemma.

May 28,30: Nistor application.

May 31: Calculations for (R, I) and (S, J) and homomorphisms $R \xrightarrow{P^t} S[[t]]$.

June 4: On homomorphisms $A \begin{smallmatrix} \theta \\ \rightrightarrows \\ \theta' \end{smallmatrix} L$ congruent modulo ideal $J \subset L$.

June 5: Lemma: Let $I \subset R$ be an ideal. The canonical map $X(R) \rightarrow S_{\natural} \otimes X(R)$ carries $F_{S \otimes I}^p X(S \otimes R)$ into $S_{\natural} \otimes F_I^p X(R)$.

June 6: On maps $A \begin{smallmatrix} \theta \\ \rightrightarrows \\ \theta' \end{smallmatrix} L \otimes B$ congruent modulo $J \otimes B$ with $S = \bigoplus_{h \geq 0} t^h J^h \subset L[[t]]$.

June 7: On algebras S, T and the canonical map $\alpha : X(S \otimes T) \rightarrow S_{\natural} \otimes X(T)$.

1993-2

June 7: Construction of Nistor's bivariant Chern Character.

June 16: Calculations for the standard normalized and unnormalized resolution of the A -bimodule A .

June 17: On the DG algebra $R = A * \mathbb{C}[D]$.

- June 22: Reconciling the approaches of Quillen and Nistor (used by Cuntz).
- June 25: On the category of filtered vector spaces.
- June 26: More on reconciling the Quillen and Cuntz approaches.
- June 30: More on Nistor and reconciling approaches to the bivariant Chern character.
- July 1: Review progress on Cuntz's version of Nistor's bivariant Chern character.
- July 3,8: On Quillen's construction of the bivariant Chern character associated to the quasi-homomorphism A
rightarrow $L \otimes B$ congruents modulo $J \otimes B$.
- July 20: Relation between $\Omega A = T_A(\Omega^1(A))$ and $T_A(A \otimes A)$ plus a note added on October 15.
- August 22: On S versus L^t .
- September 21: On HPT. Diluting a contraction to a special contraction.
- September 22,23: Mapping cylinder and Serre construction for $X \rightarrow Y$, a map of complexes.
- September 24: Perturbed contractions: $h \frac{1}{1-\theta h}$, $h \frac{1}{1-[\theta, h]}$, $\frac{1}{1-[\theta, h]} h$.
- September 25: Possible contractions on $F(f) = X \oplus Y[-1]$ with $\begin{pmatrix} d & 0 \\ f & -d \end{pmatrix}$. Formulas related to composition.
- September 26,27: Note on formulas of HPT.
- September 28: Calculations on a complex
- $$\cdots \xrightarrow{\partial} M_1 \xrightarrow{\overset{h}{\curvearrowright} \partial} M_0 \xrightarrow{\overset{h}{\curvearrowright} \partial} M_{-1} \rightarrow \cdots$$
- of A modules with contracting homotopy h .
- September 30: Constructions for \mathcal{C}_A , the category of DG A -modules (bounded below) and the corresponding homotopy category $H_0(\mathcal{C}_A)$.
- October 3,4,5: On an augmented DG algebra and its bar construction.
- October 7: On the B operator.
- October 8,10,11: On $\text{Cone}(E \xrightarrow{\eta} A)$ where A is an algebra, E a complex of bimodules and η a module map.
- October 15: On making an S -module out of $\mathcal{B} \otimes (E \otimes_A)$.
- October 17: GNS construction result: $\Gamma(A \xrightarrow{\text{in}} RA * C) = A * \tilde{C}$.
- October 27: Cartan-Eilenberg flatness using linear equations.
- October 28: Excision.
- October 29: Results for flat modules.

1993-3

- November 8: Discussion on the Karoubi operator κ on $\mathcal{C}A$ arising from the Alexander-Spanier differential.
- November 27,28: Coquereaux-Kastler lifting of ΩA into $\overline{A}\tilde{A}$.
- December 1: On mixed complexes homotopy equivalent to zero. Comment on Karoubi's κ on $\mathcal{C}A$.

December 2: More on Coquereaux-Kastler results.

December 3: Showing that $[b, h]$ induces $-S$ on M/BM when $[B, h] = 1$.

December 15: Note about motivation for B .

December 23,24: Analysis of standard bimodules resolutions of A .

December 25,26: Construction of a section of the surjection of normalized resolutions $\tilde{A} * \mathbb{C}[\epsilon] \rightarrow \tilde{A} * \mathbb{C}[\epsilon]/([\epsilon, e])$.

December 28: Canonical bimodule liftings for $A * \mathbb{C}[h] \rightarrow A * \mathbb{C}[\epsilon]$.

December 27: Key diagram for A -bimodule resolutions.

December 30: More on B -acyclic mixed complexes.

1993-4

Rough notes starting before 7 July on Cuntz's version of Nistor's bivariant Chern character.

1993-5

Rough notes written 21 July - 1 August.

1993-6

Rough notes written 7 August-21 August.

1993-7

Rough notes written 21 August - 25 August.

1993-8

Rough notes written 25 August - 31 August.

1993-9

Rough notes written in September.