1990-1

Quillen’s own index for January 22 - April 11, 1990.

January 22: Notes on BRS cohomology.
January 25: An analogy between the $(b, S, 1 – \kappa, B)$ operators and the $(d, i_X, L_X, P i_X)$ operators for manifolds with a circle action.
February 2: An analogue of the $S$ operation. Transgression.
February 3: Lundell’s construction deforming $S^2 \wedge U_n \to U_{2n}$ to a map $S^2 \wedge U_n \to U_{n+1}$.
February 4: Two methods for defining classes $c_{2n-1} \in H^{2n-1}(P), 2n > \dim B$, where $P \to B$ is a principal $U_n$-bundle over $B$.
February 6: Review of Bott map.
February 10: On $U_N/\Delta_n S^1 \times U_{N-n}$. Chern-Simons forms on a $U_n$-bundle. Variation maps.
February 12,15,16: Notes about Feigin-Tsygan on Lie algebra cohomology and Riemann-Roch.
February 20: Lecture on Lie algebra cohomology.
February 21-28: Leray spectral sequence for the principal bundle $G \to P \to B$. Spectral sequence arising from the bigraded differential algebra $\Omega(P) \otimes g^* \otimes S g^*$. Bott’s spectral sequence where $E_2 = H_{\text{diff}}(G, S g^*) \Rightarrow H^1(BG)$. Review of Leray and Bott spectral sequences.

1990-2

March 11: More on Karoubi’s $\kappa$ operator.
March 17: Formulas for a circle action on a manifolds and a discrete analogue in cyclic theory.
March 18: More on Karoubi’s $\kappa$ operator and an $S$ operator.
March 20: Formulas connected with the periodic complex $\cdots \to \mathcal{Q} \xrightarrow{d} (\Omega^1 Q)_b \xrightarrow{\beta} \mathcal{Q} \to \cdots$. Bismut’s construction for an $S^1$-manifold. Explicit calculation of the space of invariant cochains.
March 21: Questions and ideas related to the March 20 work.
March 23: On the exact sequence $0 \to sC^{n+1} \to C^n \xrightarrow{\bar{i}} sC^n \to 0$. On $\rho_A \to k$ as a connection and explicit formulas for $S$.
March 26: Karoubi’s $\tilde{\kappa}$ on $\Omega^1 A$.
March 27: More formulas related to $\Omega^n = A \otimes \mathcal{A}^{n}$.
March 28: Analysis of the Goodwillie theorems about derivations.
March 29,30: More on derivations.
April 2: A theorem on exact sequences $0 \to X \xrightarrow{i} E \xrightarrow{p} Y \to 0$.
April 3,4,6: More on Goodwillie-Rinehart.
April 7: On the map $b' : A \times \mathcal{A}^{\infty} \otimes A \to A \otimes \mathcal{A}^{\infty} \otimes A$. A contracting homotopy for the Hochschild complex in degrees $> 1$.

1990-3

April 11: Feit conference. Outline of Serre’s lectures on Galois groups and cohomology.
April 12,13: Derivations $i_{p_2}$ and $L_D$ induces by a derivation on $\Omega A$. $I_D^2 = [B, [b, H]]$.
April 14: Rinehart’s formulas.
April 16: On a representations of DG Lie algebra with basis $L, i$.

April 25: Facts about mixed complexes.

May 8: $I$-adic filtrations.

May 21, 27: Defining $L^i, i^*D$ on $\Omega A$.

May 8-June 5: Homotopy for $X(A)$.

June 8: Continuity of the homotopy with respect to the $I$-adic filtration.

June 10: Some ideas.

June 15, 21: New idea using the mixed complex $(\Omega, b, B)$.

1990-4

July 3: On the super-symmetric time evolution operator $e^{\tau X + tX^2}$ where $\tau$ is the Grassmann variable and $t$ an ordinary variable.

July 5-9: Cyclic homology of $A$ where $\Omega^1 A$ is projective, $A = B/I$ with $I$ nilpotent.

July 10: Review of earlier work on tensor products.

July 12-14: Coalgebras in the category of $A$-bimodules. Bimodule version of the bar construction.


July 19, 20: On the $\mathbb{Z}/2$ complex

$$R/I^{m+1} + [R, I^m] \xrightarrow{\mathcal{B}} (\Omega^1 R/I^m \Omega^1 R).$$

July 27: $\mathbb{Z}/2$ graded complexes $X(Q)$ and $X(Q^\ast)$ associated to $Q = QA$ considered either as an algebra or a superalgebra.

August 9, 11: On the superalgebra $A \ast k[F]$.

1990-5

August 30-September 6: Differential algebra calculations for subalgebras $S$ and $Q$ such that $S \otimes Q \equiv E$. Relative theory for a map $S \rightarrow A$ of algebras with relative constructions $R(A; S), Q(A; S), A \ast_S A, \Omega(A; S)$.

September 12: Proof that $\Omega^1(R; A) \simeq R \otimes_A M \otimes_A R$ where $R = T_A(M)$ and $M$ is an $A$-bimodule.

September 19, 20: Fredholm modules over $A$ and calculations with $EA = A \ast \mathbb{C}[F] = (QA) \times \mathbb{Z}/2$.

September 28, 29: Rough notes on $R = S \otimes Q$.

October 9: On $\Omega^1 R$.

October 11: On $R^c = R \otimes R^\circ$.

October 12: Derivations and $R \otimes R^\circ$.

November 1: Higher homotopies for traces. Summary of ideas for future reference: Kunneth theorem; deformation theory of $P\Omega(A)$; maps on periodic cyclic theory and asymptotic maps; using $X(A)$ to establish periodic cyclic homology; $(P\Omega, b, \Omega)$ gives cyclic homology and the stabilization mystery behind $K$-theory.

November 3: Calculation with the $I$-adic filtration on $R \otimes S$ where $I$ is the ideal generated by $[R, S]$. 
November 4: Polynomial families of lifting homomorphisms $A \to R$ where $A = R/I$ and $I^{m+1} = 0$.

November 8: Square zero extensions.

November 10: Traces and homology. List of ideas to develop later: Index theory on a torus; Morita type maps; homotopy.

November 11, 12: Natural homomorphism: 
$K_{1alg}(A) \to \ker\{\Omega^1 A \to \Omega^0 A, \kappa\}$
given by $g \mapsto \text{tr}(g^{-1} dg)$.

November 15: Fedosov’s proof of the Index theorem and Connes tangent groupoid.

1990-6

November 16: On $X(R) = \varprojlim X(R/I^n)$.

November 17: First order derivation of homomorphisms.

November 18: On the projection $\Omega^1 R \otimes R \to \Omega^2$ where $\Omega^1 R$ is a projection.

November 20, 21: Adic topological algebra.

November 21: Deformations and Block’s theorem.

November 28: On $\hat{R} = \varprojlim X(R/I^n)$. The Hochschild complex $A \otimes A$ in a derived category framework.

November 29, 30: Exploiting results from adic filtrations.

December 2: Reduced cyclic homology.

December 3: Why $\Pi C_n$ and $H_n^{DR}$ are not Morita invariant.

December 9: Notation for the opposite algebra $R^\circ$ and the enveloping algebra $R^e$. Summary of identities for Karoubi’s $\kappa$ operation.

December 12: On transformations of finite order.

December 18: Towards understanding homotopy and restricted homotopy.

December 20: Polynomial families of homomorphisms.

December 22: The $B$ operator on the Hochschild complex associated to $A = R/I$ where $\Omega^1 R$ is projective.

December 25, 26, 28: More on the $B$ operator on the Hochschild complex.

December 31: To show that the truncated complex $X^\alpha(R; I)$ is invariant under restricted homotopy.