60. *Galois Type Correspondence for Non-separable Normal Extensions of Fields*

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In this paper we try to extend the classical Galois-Krull theory for separable and normal extensions of fields, and the Jacobson theory for finite purely inseparable extensions of exponent 1, to general normal extensions of exponent 1 (i.e., to those extensions whose maximal pure subextensions have exponent 1).

A. **Definition 1.** An algebraic extension of fields K/k will be called *distinguished* if it is possible to find a purely inseparable subextension $L/k \subset K/k$ with K/L separable.

Proposition 1. *Let K/k be a distinguished extension of fields, k_K/k the maximal separable subextension of K/k, and K_0/k the maximal pure subextension of K/k. In this case $K=K_0 \cdot k_K$, and K/K_0 is separable. If N/k is pure and M/k is separable, the compositum $N \cdot M/k$ is distinguished.*

Corollary 1. *A separable, purely inseparable, or normal extension K/k is distinguished.*

Proposition 2. *Every algebraic extension K/k contains a maximal distinguished subextension K_d/k.*

B. Let K/k be a normal extension of fields of characteristic $p\neq 0$, of exponent 1 (i.e., such that K_0/k has exponent 1). In the following we conserve the notations from Proposition 1. We denote by $\mathcal{D}_{K/k}$, the K-linear space of all k-derivations of K, and by S the group $\mathrm{Aut}(K/k)$. It is clear that $K_0=K^S=\{x \in K, \sigma(x)=x$, for every $\sigma \in S\}$. For a K-subspace $\mathcal{A}$ of $\mathcal{D}_{K/k}$, denote by $N(\mathcal{A})$ and the annulator $\bigcap_{D\in\mathcal{A}} \mathrm{Ker}\, D$ of $\mathcal{A}$, and for a subextension $L/k\subset K/k$ denote by $\mathcal{A}(L)$ the K-subspace $\{D \in \mathcal{D}_{K/k}, D(x)=0$ for all $x \in L\}$ of $\mathcal{D}_{K/k}$.

Definition 2. A K-subspace $\mathcal{A}$ of $\mathcal{D}_{K/k}$, will be called *arithmetically maximal* (*A-maximal*) if for any other K-subspace $\mathcal{B}$ of $\mathcal{D}_{K/k}$ with $N(\mathcal{B}) = N(\mathcal{A})$ and $\mathcal{B}\supset\mathcal{A}$, we have $\mathcal{B}=\mathcal{A}$.

Corollary 2. *$\mathcal{A}$ is an A-maximal K-subspace of $\mathcal{D}_{K/k}$ if and only if $\mathcal{A}(N(\mathcal{A}))=\mathcal{A}$.*

For a derivation $D \in \mathcal{D}_{K_0/k}$ we denote by D^* the unique derivation in $\mathcal{D}_{K/k}$ which extends D([3], Chapter. X, Theorem 7 and conseq.). Note that the application $D\to D^*$ is K_0-linear and we can view $\mathcal{D}_{K_0/k}$ as a K_0-subspace in $\mathcal{D}_{K/k}$.

Definition 3. The set $G(K/k)=S\times\mathcal{D}_{K/k}$ becomes a group with the