# "REACTION-DRIFT-DIFFUSION" MODELS

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We study many-component systems of coupled nonlinear differential equations with partial derivatives of the type:

$$\frac{\partial U_1}{\partial t} = a_{1p}\frac{\partial^2 U_p}{\partial x^2} + \left(b_{1q} + b_{1pq}U_p\right)\frac{\partial U_q}{\partial x} + c_1 + c_{1n}U_n + c_{1np}U_nU_p + c_{1npq}U_nU_pU_q$$

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$$\frac{\partial U_k}{\partial t} = a_{kp}\frac{\partial^2 U_p}{\partial x^2} + \left(b_{kq} + b_{kpq}U_p\right)\frac{\partial U_q}{\partial x} + c_k + c_{kn}U_n + c_{knp}U_nU_p + c_{knpq}U_nU_pU_q$$

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$$\frac{\partial U_N}{\partial t} = a_{Np}\frac{\partial^2 U_p}{\partial x^2} + \left(b_{Nq} + b_{Npq}U_p\right)\frac{\partial U_q}{\partial x} + c_N + c_{Nn}U_n + c_{Nnp}U_nU_p + c_{Nnpq}U_nU_pU_q$$

Here the sum is taken over repeated indices from 1 to $N$. All the coefficients, in general, may be functions of coordinates and time. Such systems are used in description of various physical, chemical and biological processes in many-component media. Under certain conditions on the coefficients the system can be analytically solved. In our approach of analytical study of these nonlinear models it is possible to consider polinomials of $U_k$ of the order not higher than three. The present analytical method is based on the idea used previously for finding solutions of the Burgers equation [1], namely, the Hopf-Cole substitution [2,3]. In the most general case, this method in the same way, as for the ordinary Hopf-Cole substitution, leads to the need of solving the systems of coupled linear differential equations.

**Reference:**

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2. E. Hopf, Comm. Pure. Appl. Mech. 3, 201, 1950
3. J.D. Cole, Quart. Appl. Math. 9, 225, 1951