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Dynamics of global solutions of a semilinear parabolic equation. (English) Zbl 1194.35069

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The trivial steady state of the parabolic Cauchy problem

$$\begin{cases} u_t = \Delta u + u^p & x \in \mathbb{R}^N, t > 0, \\ u(x, 0) = u_0(x) & x \in \mathbb{R}^N, \\ u \geq 0 & x \in \mathbb{R}^N, \end{cases} \quad (1)$$

where $p > 1$, is not stable in C_0 . Moreover, if p is large enough there is a continuum of steady states of (1). These facts lead to a structurally rich set of global solutions of (1). In the present survey article the author reviews the state of the art concerning this structure. After the definition of various critical values for p the following aspects are considered: attractivity of steady states, non-convergence and quasi-convergence, grow-up of solutions, convergence to the trivial steady state, convergence to self-similar solutions, and rapidly decaying solutions.

For the entire collection see [\[Zbl 1165.35002\]](#).

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MSC:

- [35B40](#) Asymptotic behavior of solutions to PDEs
- [35K15](#) Initial value problems for second-order parabolic equations
- [35B09](#) Positive solutions to PDEs
- [35B33](#) Critical exponents in context of PDEs
- [35B30](#) Dependence of solutions to PDEs on initial and/or boundary data and/or on parameters of PDEs
- [35K58](#) Semilinear parabolic equations

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Keywords:

[semilinear parabolic problem](#); [Fujita type results](#); [non-convergence and quasi-convergence](#)