1980

1980-1. $I(h) = \oint_{H=h}(P\,dx + Q\,dy)$. Find an upper bound for the number of zeros of the function I.

1980-2. The boundary value problem for $\dot{x} = P(x, e^{it})$, $x(2\pi) = x(0)$: the number of solutions.

1980-3. The number of limit cycles emerging in the "Lotka–Volterra" system

$$\begin{cases} \dot{x} = x\,(\alpha + \beta x + \gamma y + \cdots) \\ \dot{y} = y\,(\delta + \varepsilon x + \zeta y + \cdots) \end{cases}$$

near $\alpha = \delta = 0$. In particular, integrals along $x^p y^q z^r = h$, $z = 1 - x - y$.

1980-4 (E. A. Demëkhin)**.** Explain the strange bifurcations of 2π-periodic solutions of the equation $k^3 x^{\mathrm{IV}} + k\ddot{x} + \dot{x}^2 = 0$ as the parameter k varies.

1980-5. Investigate the structural stability of contact fields in $\mathbb{R}^3$.

1980-6. Apply the mixed Hodge structures to the Jacobian problem (in both cases analyticity differs from algebraicity!).

1980-7. Construct a theory of caustic cobordisms (different from that of Lagrangian cobordisms).

1980-8. In the theory of singularities (e. g., critical points of functions), why is the codimension in the real case the same as in the complex case? *Compare with the* $\mathbb{R}$- *and* $\mathbb{C}$-*modality and with the* (*co*)*dimension of the prolonged self-intersection line of the swallowtail or the umbrella.*

1980-9. Apply mixed Hodge structures to real algebraic geometry. For example, for estimation of topological invariants of real Morsifications, and for investigation of the topology of discriminants.

1980-10. Apply mixed Hodge structures to problems concerning superpositions—for they "remember" the dimension of the smooth algebraic cycle from which a given (co)cycle originates (say, on the graph, or on the discriminant, or on the complement).

1980-11. Prove the semicontinuity of the spectrum of singularity. If the singularity S is adjacent to a simpler singularity S' with $\mu' < \mu$, then $l_k \le l'_k$ for $k = 1, \dots, \mu'$.

1980-12. Complexify the homology theory.

1980-13. Do there exist any formulae for the complete invariants convolution in terms of the linearized convolution (similar to the Campbell–Hausdorff formula representing multiplication in a Lie group via the commutator of its Lie algebra)?

1980-14. What is the complex analog of the generalized Whitehead groups in algebraic K-theory? *One of the candidates is the "quasiresolvent" of the fundamental group of the complement of the bifurcation diagram of a singularity.*

1980-15. The embedding of the base $\mathbb{C}^{\mu'}$ of a versal unfolding of a simpler singularity S' into the base $\mathbb{C}^{\mu}$ of a versal unfolding of a more complicated singularity S $(\mu > \mu')$ induces a homomorphism

$$H^*(\mathbb{C}^{\mu} \setminus \Sigma) \to H^*(\mathbb{C}^{\mu'} \setminus \Sigma')$$

of the cohomology rings of complements of the corresponding bifurcation diagrams.

Are these homomorphisms canonical? Is it possible to define the stable cohomology ring?

1980-16. Does the real modality of a real singularity with finite multiplicity $f : (\mathbb{R}^n, 0) \to (\mathbb{R}, 0)$ always coincide with the complex modality?

1980-17. Show that the function $F = \max_x f(x, \cdot)$ is topologically equivalent to a Morse function for a generic family f.