

THE 1949-1951 ANTI-RESONANCE CAMPAIGN IN SOVIET SCIENCE

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RESUMEN

La campaña anti-resonancia fue una de las campañas político-ideológicas que tuvieron lugar en la ciencia soviética de la postguerra (lysenkovismo, los debates en psicología fisiológica, etc). En contraste con las dos versiones más difundidas de esta campaña (la del legítimo criticismo científico y la de la lucha entre fanáticos ideológicos y genuinos científicos), se muestra su naturaleza de rito religioso.

ABSTRACT

The anti-resonance campaign was one of a number of the politico-ideological campaigns that were held in Soviet science in the postwar period (Lysenkovism, the debates in physiological psychology, etc). In contrast to the two widespread accounts of this campaign (the legitimate scientific criticism and the struggle between ideological zealots and genuine scientists), its nature as a religious rite is shown.

Palabras clave: Quantum chemistry, Science & Ideology.

Here I shall describe a politico-ideological assault on the theory of resonance, one of the earliest quantum-chemical theories. It came immediately after three notorious events: the 1946 Decision of the Central Committee of the Communist Party (at that time it is called the All-Union Communist Party of Bolsheviks -in Russian abbreviated form: VKP(b)) on the journals *Zvezda* and *Leningrad*, the 1948 Session of the Agricultural Academy (Lysenkovism), and the 1948 Decision on Vano Muradeli's opera *The Great Friendship*. When the campaign was at full swing another lamentable event took place: the Joint Session of the USSR Academy of Sciences and the Academy of Medical Sciences that came down in history as the Pavlov Session. It was held in 1950. The anti-resonance campaign was launched as a

series of denunciations in the press and at the scientific conferences, reached its peak at the All-Union Conference on the Problems of the Theory of Structure in Organic Chemistry held in 1951, and resolved into a series of small conferences and denunciations.

The aim of this paper is not to expose the horror of Stalinism and accuse anybody. My concern is the description of a phenomenon of a politico-ideological campaign in science. In contrast to the two popular views on the anti-resonance campaign (legitimate scientific criticism in the form of politico-ideological campaign and struggle between genuine scholars and ideological zealots), I interpret it as a kind of religious rite in science.

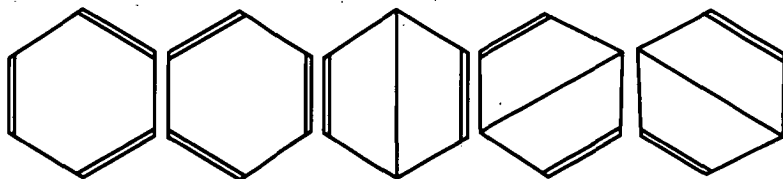
At the beginning of the paper let me concentrate on the explanation of some important terms.

1. Explanation of some terms

The theory of resonance

The theory of resonance is historically rooted in W. Heisenberg's paper on quantum states of the helium atom. Heisenberg pointed out that the quantum mechanical treatment of helium had somewhat analogues to the classical treatment of a system of resonating coupled harmonic oscillators. Following Heisenberg, the American scientist L. Pauling interpreted the chemical bond in the hydrogen molecule as a result of resonance interaction of electron oscillators covering the coupled hydrogen atoms (1928).

But the main point of the theory of resonance is not the mechanical phenomenon of resonance. This is a representation of the structure of a molecule as a superposition of several valence bond structures. Benzene provides an interesting illustration of such a representation (every single stroke in a valence bond structure symbolizes a valency unit of the atom in the compound or a bond, that is formed by pairing electrons of two atoms):



The difference between the energy value of benzene in its normal state and the energy value of the most stable of valence bond structure of benzene is called the energy of resonance. On the base of this conception the stability of benzene and other aromatic compounds has been explained.

Mesomerism

The term is next to the resonance. However the conception of mesomerism was proposed by the English chemist C.K. Ingold within the framework of the classical electronic theory of organic chemistry. By mesomerism one means the electronic shift in a molecule which is proposed to explain that the actual state of the molecule is intermediate between the states described by valence bond structures.

The theory of resonance provided quantum chemical interpretation of mesomerism by pointing to the resonance stabilization as a specific quantum effect. C.K. Ingold, who put forward the conception of mesomerism in 1933, a bit later in fact joined L. Pauling's theory of resonance.

Butlerov's theory of chemical structure

This is the name given in the USSR to the classical theory of chemical structure that was formulated by Kekule, Kolbe and some other chemists at the beginning of the last half of the last century. The Russian chemist A.M. Butlerov (1826-1886) contributed to this theory. In some of his writings he emphasized the nonmechanic character of the structure of molecules and pointed out that the chemical structure should not be identified with a chemical formula: a chemical compound had the only structure which could be presented by some formulas. Those comments were used in the course of the anti-resonance campaign.

Ideology

Ideology in the USSR under Stalinism was not only *the bodies of publicly and officially articulated ideas and doctrines relating to policy, ideas and actions and in particular statements about scientific enterprise*¹, but also tacit prescriptions for every citizen about how to behave, for instance, *applaud staying when Stalin's name has been pronounced*. The base of ideology was dialectical materialism, which resulted from a vulgarization of Marxism and became a mix of philosophy and religion:

Mechanism (mechanistic world-picture)

Mechanism was one of the main target of F. Engels' criticism (see his *Herrn Eugen Dürings Umwälzung der Wissenschaft, Dialektik der Natur*, etc.).

Following this criticism Soviet dialectics (Deborin's school) proclaimed that mechanism was the chief philosophical foe of dialectical materialism. Though the succeeding generation of Soviet ideologists (M. Mitin, P. Yudin, *et al.*) routed Deborin's school (many Deborin's disciples were executed in connection with its attacks), it inherited Deborin's anti-mechanistic trust and advanced this trust in the course of the Lysenko campaign, antiresonance drive and similar activities. Mechanism was connected by Soviet ideologists with bourgeois approach to some social processes. One could read even in the 1961 book that *the reactionary political essence of mechanism was shown when it became a theoretical base of the 'right inclination' proclaiming 'peaceful growing of the kulaks into socialism'*².

Machism

The philosophy of E. Mach was treated in Lenin's *Materialism and Empiriocriticism* as a bourgeois philosophy, a *contemptuous party in philosophy mixing idealism and materialism*. Machism became a symbol of bourgeois philosophy and an apostasy in early 1930s. Usually in Soviet literature a rank of philosophical teachings belonging to the *second positivism* or positivism in general was labeled by this name.

The Academy of Sciences of the USSR

The USSR Academy of Science, in a sense a tremendous state organization, a mixture of academy and ministry, has placed under its control almost all the fundamental scientific researches in the country. This Academy is built like a hierarchy. The Academy consists of sections, a section consists of departments (I shall be concerned in the following exposition with the Department of Chemical Sciences), departments consist of research institutes and other scientific enterprises (the Institute for Organic Chemistry will be mentioned in this paper).

Besides the institutes, which belong to the Academy, there were important *branch* institutes under ministries command (for example the Karpov Physico-Chemical Institute, which will be mentioned below). However these institutes depend on the Academy authorities too.

Academicians (full members of the USSR Academy of Sciences) and Corresponding members of the Academy

These are the highest scientific degrees in the USSR and Russia. Professors and Doctors are of less importance. Academicians and corresponding members receive an special extra salary and have privileges till

now. Academicians elect new members of the Academy, corresponding members take part in the election of new corresponding members.

The formation of the Russian Academy of Sciences has practically been reduced to the incorporation of the new elected Russian academicians and corresponding members into the staff of the USSR Academy of Sciences and some shifts in the administrative body of this Academy.

2. Bykov's view: legitimate scientific criticism in the form of politico-ideological campaign

G.V. Bykov (1914-1982), a prominent Soviet historian of chemistry, the author of the fundamental trilogy *The history of the classical theory of structure in organic chemistry*, *The history of the electronic theories in organic chemistry*, *The history of stereochemistry of organic compounds* was the first who took the anti-resonance campaign under historical consideration. G.V. Bykov himself contributed to the campaign although he did not play any leading part in it. He worked then on the preparation for the press of the Collection of Papers of A.M. Butlerov, a Russian chemist who had become by irony of fate a banner under which the anti-resonance campaign was developing. As many other chemists, Bykov defended the Butlerov theory of chemical structure against the theory of resonance.

Bykov, in his historical writings [1961], considered the anti-resonance campaign to be legitimate in its core scientific criticism and, following to some anti-resonance activists, accused the theory of philosophic pragmatism (literally accused as in accordance with Soviet ideology exclusively materialism had to be a philosophical base of any scientific theory). Nevertheless, Bykov provided the true historical chain of happenings. This chain runs as follows.

The theory of resonance was put forward by L. Pauling and J. Wheland, was supported by a number of specialists in quantum chemistry in the 1930s, penetrated into the USSR literature at the end of the 1930s, and in the immediate postwar period *took the dominant position in the USSR organic chemistry*, with the Soviet chemists Y. Syrkin (1894-1974) -elected 1943 Corresponding member of the USSR Academy of Science, 1964 Academician- and M. Dyatkina (1915-1972) being the main enthusiasts and propagandists of it.

Although the theory of resonance was taken under criticism by the Soviet chemist Ufimtsev as early as 1943, the criticism to deprive it of its scientific

value was started in Chelintsev's writings (1946-1949). In his denunciation of the theory of resonance Chelintsev stood up for his *new structural theory*, which was meant by him to replace quantum organic chemistry. He constructed this theory in pretentious language by suggesting arbitrary hypotheses. To expose Chelintsev's style, Bykov cited his definition of the *new structural theory* [1946, p. 556]:

"The treatment of a particle as an orbital-contact-polar system constructed on the base of rules of valency, octet, coordination, electrostatics, tetrahedron and packing, situated in space, fields, motions, is a subject of the *new structural theory*, which covers the structural, electronic, steric, coordination, mechanic and polar theories in chemistry".

Bykov is right in stressing that Soviet chemists did not support Chelintsev's ambitions to be a great theoretician and identified themselves with A.N. Nesmeyanov (1899-1980, elected 1943 Academician, President of the USSR Academy of Science during 1951-1961); a prominent figure in Soviet chemistry, who was a target of Chelintsev's criticism, argued with him, and disavowed his *new structural theory*. However Bykov, as it was noted above, treated the anti-resonance campaign as legitimate scientific criticism. How to combine such a treatment with recognition of Chelintsev failure? According to Bykov, this campaign was a controversy between proponents of the theory of resonance (Syrkin, Dyatkina, *et al.*) and the majority of Soviet chemists but not Chelintsev. He mentioned the quantum-mechanical criticism, which had been developed against the theory of resonance in the *very strongly worded article* by then young chemists of the Moscow University V.M. Tatevsky and M.I. Shakhparonov. However, in Bykov's opinion, the main point was a shift in the position of Nesmeyanov's school which had taken advantage of the theory of resonance in 1946-1949 but then demarcated resonance and mesomerism and started to treat the theory of resonance as an ill-founded explanation of mesomerism. Bykov referred also to O. Reutov review on Chelintsev's 1949 book that had appeared in the same issue of journal *Voprosy filosofii*, where Tatevsky and Shakhparonov's article had been published. This review had been devoted to denunciation of Chelintsev's book and, at the same time, the theory of resonance, which had been called a misrepresentation of mesomerism. Reutov wrote [1949, p. 311] that the things in the theory of resonance stood on their heads rather than on their feet (an allusion to Engel's assessment of Hegel's philosophy).

Bykov was aware of the political reasons of the antiresonance campaign. But he was not actually concerned with them. However the denunciation of the theory of resonance, which had appeared in Tatevsky and Shakhparonov's article and Reutov's review and had been supported by Nesmeyanov and his

school, can not be explained within the framework of the history of scientific ideas. In contrast to Bykov's approach, this was an articulate fact of the social history of science. Tatevsky, Shakhparonov and Reutov had launched the anti-resonance campaign as they had proclaimed the theory of resonance to be inconsistent with Marxism-Leninism. Bykov emphasized elements of scientific criticism in their writings. But those elements had not been developed in the course of the campaign and come down to naught. The quantum criticism, which came from Tatevsky and Shakhparonov's article, was included in political denunciation of the theory of resonance and turned into a cliché: *physically-inconsistent-and-methodologically-erroneous* pronounced as one word.

It should be noted that Tatevsky and Shakhparonov's quantum criticism was disavowed at the Seminar of Leningrad theoreticians (V.A. Fock, M. Veselov, *et al.*)³. Although this seminar was organized in the course of the fight against the theory of resonance, V.A. Fock, who used to speak what he thought, objected all the points of Tatevsky and Shakhparonov's criticism. But it was not Fock's objections to undermine the quantum criticism of the theory of resonance (although the report on the meeting of Leningrad theoreticians had not been published, the speech of such a famous physicist as Fock could not pass unnoticed). This criticism became extra in the course of the anti-resonance campaign, which concentrated more and more on philosophical and political accusations.

Nesmeyanov and Reutov's criticism, based on the demarcation between resonance and mesomerism, had not a formative influence either. The 1951 All-Union Conference on the Problems of the Theory of Structure in Organic Chemistry beat in its resolution the integral theory of resonance-mesomerism. Reutov, in his contribution to this conference, did not demarcate between resonance and mesomerism and joined the common opinion expressed in the resolution of the Conference. After the conference he wrote some papers, in which he fought against the theory of resonance-mesomerism as a non-materialistic theory.

Bykov passed by a hit in Y. Zhdanov's article on Butlerov's theory of chemical structure (1949). Y. Zhdanov (he was born in 1919), a son of the late main ideologist of the Soviet Union, was then head of the Department of Science of the Central Committee of the Communist Party. Y. Zhdanov coined the only depreciative sentence on the *theoreticians of resonance* but it flashed as a signal rocket.

Y. Zhdanov's review on A.M. Butlerov's *Collected Works* preceded immediately the 1951 All-Union Conference on the Problems of the Theory

of Structure in Organic Chemistry. He accused in this review Syrkin and Dyatkina, the two Soviet supporters of the theory of resonance, of mechanism, mathematical formalism and the ignorance of the *best achievements of Russian and Soviet science* [1951, p. 70].

The evolution of Nesmeyanov and his colleagues, that Bykov mentioned, was an example of the phenomenon called *adaptive ideological behavior* by M. Adams [1980]. Nesmeyanov and others had recognized that Soviet chemists had not run from the struggle against the bourgeois ideology, and decided to give up the suspicious theory of resonance.

By the way, Chelintsev recognized the political backgrounds of Nesmeyanov and his colleagues' behavior. He wrote [1950, p. 170] that from the very beginnings the Paulingists-Ingoldists of this country (a copy of the expression *the Veismanists-Morganists* introduced by Lysenkovists) had given a hostile reception to his criticism of the theory of resonance. *The things changed after the decisions of the CK VKP(b) on ideological matters and the presentation 'On the situation in biology' contributed by T.D. Lysenko. The Paulingists-Ingoldists of this country recognized that their mistakes -the non-critical acceptance and propaganda of the theory of resonance-mesomerism, the suppression of my criticism, the oblivion of Butlerov's teaching- should somehow be corrected.*

To be sure Chelintsev saw the things through spectacles of current Soviet ideological commitments. Bykov's historical sight was also loaded by elements of dialectical materialism. But Bykov sympathized with Nesmeyanov and Reutov's way of the anti-resonance activity and did not articulate their ideological presumptions. He articulated just Chelintsev's *arbitrary hypotheses and pretentious language.*

3. Loran Graham's view: struggle between genuine scholars and ideological zealots

The historical-cultural aspects of the anti-resonance campaign were discussed by L. Graham, an American historian of Soviet science [1972, 1987]. He says that from the start the anti-resonance campaign had something in common with the Lysenko induced witch-hunt. It begun from bellōw by the chemists who were displeased with the alignment of forces in their science. The campaign was an attempt on their part to change the situation to their benefit with the help of the Party bodies and the dominating philosophy. However the anti-resonance campaign failed to develop into a destructive

process like that in biology. Those who headed the Soviet natural sciences at that time were deeply concerned with an uninterrupted advance in chemistry.

Graham's outlook needs some corrections. First of all the anti-resonance campaign was not *a struggle between genuine scholars, on the one hand, and ignorant careerists and ideological zealots, on the other* [1970, p. 22]. There was no real controversy during the campaign as nobody defended the theory of resonance. All the chemists involved into the campaign were beating one of quantum-chemical theories when the anti-resonance campaign was in full swing (in 1950-1951).

L. Graham claims that *Chelintsev was a central figure* in the anti-resonance activity [1972, p. 302]. It is not the case. Chelintsev's writings (1946-1949) belonged rather to the pre-history of the anti-resonance campaign because his attacks had no support among chemists. As it was mentioned above, the anti-resonance campaign was initiated in 1949 by Tatevsky and Shakhparonov's article, which had no reference to Chelintsev's papers, Reutov's review on Chelintsev's 1949 book, that combined the criticism of Chelintsev's *new structural theory* with denunciation of the theory of resonance, and (a very important fact) a hint in Y. Zhdanov's article on Butlerov's theory of chemical structure. Chelintsev was pressed back at once. He was aware himself of this as he said in speech at the 1951 All-Union Conference that this assembly, as distinct from the previous meetings of such a kind (the notorious session of the Agricultural Academy and others), had been prepared by the side under criticism.

In contrast to Lysenko, Chelintsev (1904-1962) was not a leader of any scientific group. Lysenko represented a number of practical workers in selection (selectionists) who had a false idea of their scientific importance and careerists joined them. Chelintsev was alone. Contrary to L. Graham's opinion, he was not an *undistinguished chemist*. He performed a number of important syntheses (for example, he contributed a lot to the synthesis of Acrichinum). However he considered himself to be a great theoretician and opposed himself to the majority of chemists. He was beaten together with the theory of resonance against which he fought.

L. Graham has lost sight of the important feature of the Soviet ideology which the anti-resonance campaign manifested. This is its ritual character. Rite is organically included in religious behavior. That religion is an attribute of Soviet Communism was pointed out by the Russian philosopher Berdjajev and the British philosopher Russell, and everyone, who writes about the history of Soviet culture, should not pass by this their claim.

The rite of ideological debates in science rose in Soviet science after World War II. Those debates were devoted to the denunciation of some scientific conceptions which were considered inconsistent with Marxism-Leninism. Such debates presupposed a broad campaign in scientific journals and mass media and All-Union Conferences with participation of prominent figures. By participating in such debates a scientist renewed in mind dialectical materialism in order to prevent himself from becoming conformed to bourgeois ideology.

L. Graham is right in stressing that some debates became vehicles for some people to beat their scientific opponents. The debate which came to the 1948 Session of Agricultural Academy (Lysenkovism) provides a good example of such a vehicle. The debate about physiological psychology (Pavlov's session) turned out to be something like that.

But there were debates which resulted in a very small shift in the administrative body of science. The debate about resonance belongs to such a group. The debate about the history of science, that was held at the beginning of the 1950s, resulted in no shift in the administrative body.

It makes some difference how scientists participated in the debates. Some of them, like G.V. Bykov, regarded those debates as a legitimate form of scientific criticism and attempted to contribute to them. Others respected just the politico-ideological aspect of the debate and supported it. Their principle could be formulated in Orwell's expression *Always yell with the crowd, it is the only way to be safe* [1984, p. 261].

Graham seems not to be right in saying that the anti-resonance campaign begun like Lysenkovism. This campaign was unlikely initiated from below by chemists. It was launched practically at the same time by Y. Zhdanov, head of a department of the Central Committee of the Communist Party, O. Reutov, who was Zhdanov's relation, and V.M. Tatevsky and M.I. Shakhparonov, who worked, as O. Reutov, at the Chemical Faculty of the Lomonosov Moscow State University.

Graham is right in saying that, in contrast to Lysenkovism, the anti-resonance campaign brought no considerable shift in the administration of chemical science. One could add however that the shifts were not planned (Chelintsev and some others planned perhaps them but their plans were not taken seriously by the majority of chemists). True, the main adepts of the theory of resonance (Syrkin and Dytkina) suffered: they were dismissed from the Karpov Physico-Chemical Institution where they worked as researchers. Syrkin lost his position of professor in this institution. The others being

under criticism did not suffer much. M.V. Volkenstein, who was sometimes mentioned as an adept of the theory resonance together with Syrkin and Dytkina, lost temporarily his second job as a lecturer in college⁴. Nesmejanov, who was the main target for Chelintsev and some other active workers of the anti-resonance campaign, was appointed as President of the USSR Academy of Science in 1951, that is, he took one of the most important positions in the state.

The anti-resonance campaign, especially the 1951 All-Union Conference on the Problems of the Theory of Structure in Organic Chemistry, looks like a religious rite with the quantum-chemical theory and its adepts being the sacrificial lambs. The conference and meetings within the campaign bring to mind ritual dances where academicians, corresponding members, professors, academics without degrees and the public took part.

4. My view: religious rite in science

To justify my view I need in discussing the following three issues:

1. The unusual philosophical activity which Soviet chemists developed in 1949-1951. Soviet chemists performed the rite: they followed the paradigm of Lysenkovism, the struggle for materialistic psychology and other campaign.

2. The procedure of the 1951 All-Union Conference on the Problems of the Theory of Structure in Organic Chemistry. This conference was organized as a theatrical performance rather than as a scientific debate.

3. The case of Soviet quantum chemistry. The anti-resonance campaign was actually out of touch with the problems of quantum chemistry.

4.1. The unusual philosophical activity of Soviet chemists

Contrary to frequent assertions, the anti-resonance campaign was far from an *incompetent intrusion* of philosophers into the realm of chemistry. On the contrary, it was chemists trying their hands in philosophy. Witness what Bonifatij Kedrov, then Corresponding Member of the USSR AS (later an Academy Member), one of the two philosophers who participated at the 1951 All-Union Conference, said:

"Philosophers are indebted to chemists. We joined the anti-resonance campaign at a later stage when the philosophical aspects of the theory were taken

to shreds by chemists themselves. Philosophers have to admit this by way of selfcriticism"⁵.

Nevertheless Kedrov came across the question:

"Why are philosophers always late when it comes to ideological struggle? Practically in all cases they joined the ranks of fighters only after deviations had been detected by specialists themselves (biologists, the discussion in the Agricultural Academy, etc.)".

He gave a wage answer. What is more important is the defensive position of Kedrov, who represented philosophers at this conference.

How was the philosophical criticism of the resonance unfolding? I have already written that Prof. Chelintsev's 1946-1949 writings belong to the pre-history of anti-resonance campaign. His first articles were free of ideological denunciations. At the initial stages Chelintsev played with vague philosophical allusions. In 1946, in his effort to denounce quantum chemistry, he opposed the *fuzzy electron* of quantum mechanics to the *chemical world* composed of *qualitatively different particles* tied together by *ever efficient and interacting forces of covalency and electrovalency*, the quantitative changes in the forces leading to the qualitative changes in particles [1946, p. 552].

In 1949 this opposition turned into a philosophical accusation that the theory of resonance was committed to be mechanism.

"The resonance theory is nothing more than the abortive attempt to create a mechanistic theory in chemistry by reducing chemistry to mechanics" [1949, p. 420].

Chelintsev was riding the wave of struggle against the cosmopolitanism that was rising when he wrote:

"In the same way as the theory of the atom in quantum mechanics rests on the Mendeleev Periodic System the true theory of the structure of molecule within quantum mechanics is possible only within the limits of Butlerov structural theory".

This was not an innocent joke. These accusations meant excommunication from the Marxist-Leninist orthodox approaches and were the favorite weapon of the Lysenko supporters, who used it against those who followed Mendel and Morgan. By the fifties even more deadly accusations of idealism and Machism, as the latest form of idealism, had come in vogue.

Materialism and idealism, the two philosophical *camp*s, were seen as the socialist and the capitalist *camp*s in social life.

The above 1949 Tatevsky and Shakhparonov article branded the theory of resonance Machist:

"It follows from the basic propositions of the theory of resonance that the process of cognition of the properties and relationship of real molecules is nothing else but an investigation of our minds, the properties and relations of fictitious images. Evidently this theory has nothing in common with materialism and is completely Machist where its philosophical content is concerned" [1949, p. 184].

Tatevsky and Shakhparonov accused Syrkin and Dytkina of cosmopolitanism and servility to Western bourgeois science.

In the 1950 article published in the *Zhurnal fizicheskoy himii* (Journal of Physical Chemistry) Tatevsky accused the theory of resonance again of Machism.

The Tatevsky and Shakhparonov articles drew different responses. The philosophers M. Kamari and I. Kuznetsov [1950, p. 73] tried to make two philosophizing chemists to see reason. In an article published in the *Bolshevik* journal they pointed to a predatory and tendentious nature of criticism. What is more, they indicated that Tatevsky and Shakhparonov let the principle of superposition, the foundation of quantum mechanics, be outside the scope of their criticism.

Allusions to Machism were made by other chemists as well. In 1949, the Academician A. Nesmeyanov, in an endeavor to beat off Chelintsev's politico-ideological attack, admitted that Machism, rather than mechanism, was the weak point of supporters of the theory of resonance [1949, p. 424]. The future President of the USSR Academy of Sciences refrained from discussing the theory of resonance in the context of the unfolding struggle of philosophical schools. He tried to remain within certain limits by accusing some of the theory proponents, rather than the theory itself, of Machism. Very soon these limits were violated. Speaking at the 1950 Learned Council of the Institute of Organic Chemistry, that was engaged in the excommunicating of the theory of resonance, O. Reutov treated the theory as *speculative and idealistic*. At the 1951 All-Union Conference this description was even more pronounced. In the introductory report the Academician A. Terenin said that *this theory has nothing in common with materialism. Judging by its philosophical content, it is an idealistic theory* [*The State of the Theory of Chemical Structure...*, p. 36].

Some other chemists took an active part in the anti-resonance campaign as well. M.I. Batuev, a researcher of the Institute of Organic Chemistry, put forward the vulgar antiphysicalistic principle of dynamic unity of molecule. He attacked the supporters of the theory of resonance, especially A.N. Nesmeyanov. V.K. Semenchenko (the Lomonosov Moscow State University) was close to him in attacking the problem of molecule structure. V.K. Semenchenko claimed that all the theory of quantum mechanics had been penetrated by Machism and Neo-Kantianism. A.P. Mescherekov (the Institute of Organic Chemistry) called for *a creative application of Marxist-Leninist philosophy to chemistry* [*The State of the Theory of Chemical Structure*, 1952, p. 342].

So, a considerable amount of Soviet chemists gave themselves access to dialectical-materialism and Soviet ideology.

4.2. The procedure of the 1951 All-Union Conferences on the Problems of Chemical Structure in Organic Chemistry

To prepare this conference the Department of Chemical Sciences of the Academy of Sciences of the USSR organized a commission. The Academician A. Terenin, The Corresponding Member I.L. Knunyants (elected 1953 as Academician), Professor M. Kabachnik, Doctor O. Reutov and some other leading figures in organic chemistry were appointed as members of it. Records of thirteen meetings of the Commission of the Department of Chemical Sciences (some meetings took several days) are kept in the Archive of the Russian Academy of Sciences. Three subcommissions were organized to prepare the divisions of the report for the All-Union Conference. *It took a lot of time*, M.I. Kabachnik recalls⁶.

The commission was a part of the bureaucratic structure of the Academy of Sciences: it was to solve the problem whose solution had been given in advance. The commission was to prove the validity of Butlerov's theory of chemical structure in 20th century and denounce the theory of resonance.

Nevertheless the commission could not avoid any scientific discussions. Tatevsky was invited to participate at a meeting of the commission and present his criticism of the theory of resonance and his scientific program. The commission did not appreciate his program. The participants of the meeting, who took the floor after Tatevsky's speech, told that Tatevsky proposed an empirical scheme which had not extensive applications in organic chemistry.

Syrkin and Dytkina were invited to participate at the commission's session as well. They got an opportunity to say a word in defence of the

theory of resonance and present their approach to quantum chemistry. *They have not been publishing our writings for two years*, Syrkin and Dytkina said⁷. They had got advice to confess. After that they joined the denunciation of the theory of resonance.

The special Leningrad seminar was held within the framework of the activity of the commission. That was a mixed seminar where some members of the commission and the Leningrad theoreticians, the Leningrad specialists in the theory of molecular structure, came together. As it was mentioned above, the Leningrad theoreticians disavowed the quantum criticism of the theory of resonance that came from Tatevsky and Shakhparonov's articles. However, the Leningrad seminar is not of only historical importance. Speaking at the seminar V.A. Fock discussed a number of the problems of the interpretation of approximating methods of quantum mechanics. That discussion can be considered to be the development of his yearly ideas.

M.V. Volkenstein, who took part at the seminar, condemned Tatevsky's attack against Syrkin and Dytkina. *The stile of this attack made a repulsive impression*, he said⁸.

However I have described epiphenomena of the commission's activity. The point of this activity was the politico-ideological denunciation of the theory of resonance. The results of the discussion of the Leningrad theoreticians had not be used by the commission in its report.

This specific of this report, which planned to be a base of the debates at the All-Union Conference, may be illustrated by observing the discussion of it at the session (13.02.1951) of the Department of Chemical Sciences of the USSR Academy of Sciences. One learns from the verbatim report of this session that many respectable Academicians, members of the Bureau of the Department, had not read the report of the commission which had been presented for the discussion at the session. The Nobel Prize winner Academician N.N. Semenov had not read it, Academician V.M. Rodionov had not read it, Academician S.I. Volfkovich had glanced over it, Academician Frumkin had glanced over... *If two months more have been given they would not have read it either*, said disappointedly C.I. Poroshin, Scientific Secretary of the Department.

Corresponding member I.L. Knunyants, who was a member of the commission, said:

"I can not understand the idea of this session. Our report will be sanctioned and recommended for the press but if it is sanctioned and recommended, I ask you

how it can be done if the majority of the respectable members of the Bureau of the Department of Chemical Sciences have not read it (...) We came to this session to receive suggestions and the Bolshevik criticism of our report and then came out in a united front at the All-Union Conference (...) You don't want to do so"⁹.

He received a vague answer:

"We are not going to approve the report. We put the problem to take the report under consideration and recommend it for the discussion at the All-Union Conference".

The All-Union Conference on the Problem of Chemical Structure in Organic Chemistry took four days (11-14.06.1951). The forty three persons were given the floor after Academician Terenin, who had read the commission's report. The other thirteen persons presented their contributions in a written form. The meeting ended by adopting the resolution in which the commission's report was regarded as correct in its core, but the problem was put to revise and improve this report taking under consideration the *ideological situation in natural sciences* and the weak points of the scientific program presented in the report. This was a resolution typical for such conferences. To embody this resolution in a new report a new commission under Nobel Prize winner N.N. Semenov as Chairman was organized by the Presidium of the USSR Academy of Sciences.

The speakers at the 1951 All-Union Conferences can be classified in different ways. One can demarcate between the group of speakers who condemned not only resonance but mesomerism, and the group who condemned resonance and defended mesomerism. As it was mentioned above, the united theory of resonance-mesomerism was eventually denounced at the Conference. One can demarcate the group of speakers who had something against quantum chemistry and those who defended that theory. The indication *the approach to Chelintsev's new structural theory* can be used as a base of classification: some speakers criticized *the new structural theory*, some of them left it out.

However, these classifications concentrate on the epiphenomena of the 1951 All-Union Conference. The main point of this conference was a rite, a sacrificial slaughter of the lambs, the theory of resonance and its adepts.

I propose the following classification of the speakers at the conference. I arrange all the speakers into three groups. The first is the group of active workers: G.V. Chelintsev, who proposed the list of *Ingoldist-Paulingists*; M.I. Batuev, who attacked Academician A.N. Nesmeyanov; A.P. Mescherekov, who claimed that dialectical materialism should be included into

chemistry; N.N. Chitrik, who worked together with Chelintsev in the Military Academy of Chemical Defence and supported his coworker; V.E. Lvov, a writer, a representative of the public. The active workers tried to find out the social base of the theory of resonance in Soviet chemistry, demanded changes in the administrative body of organic chemistry.

The second group is *victims* (Syrkin, Dytkina, Volkenstein). The victims confessed, demonstrated self-flagelation.

The others were suppers. They performed a rite. The oath of allegiance to Butlerov's theory of chemical structure was an indispensable component of their contributions. The second indispensable component was to say something against the theory of resonance and/or its supporters. In other respects suppers discussed in their contributions very different matters organic synthesis, quantum chemistry, quantum mechanics, catalysis, the theory of solutions, etc. Many of the suppers criticized Chelintsev's *new structural theory*.

My classification is a little arbitrary -like every classification. Sometimes suppers became active workers for a moment. For example, O. Reutov called to respect as suspicious some experimental facts to which Syrkin had pointed in his contribution, Corresponding member A.D. Petrov claimed that the electronic theories could be only an auxiliary device of the theory of molecular structure in organic chemistry, Professor M.I. Usanovich wanted the audience to pay attention to the ideological situation in some other fields of chemistry.

However, the suppers did not cross the frontier. They kept the All-Union Conference in its trend to preserve status quo in Soviet chemistry and did not result to administrative shifts.

Could the participation of active workers be avoided at the All-Union Conference? Yes, it could. But the conference would lose its quality and would not look like a good spectacle. If active workers took part of executioners at the 1948 Session of the Agricultural Academy, than at the 1951 All-Union Conference they took part as jokers.

Resuming the program of the development of the theory of organic chemistry, that was elaborated at the 1951 All-Union Conference, G.V. Bykov, who, as it was mentioned above, symphatized with the anti-resonance campaign, pointed out the following:

"Intensify work in the field of the theory in organic chemistry, develop the theory of the mutual influence of atoms in molecules by extending the principles of Butlerov's theory of chemical structure, elaborate calculational methods of quantum chemistry by using experimental and theoretical results of physics" [1961, p. 323].

Had the doctrinal reference to Butlerov's theory been omitted that program was reduced to a number of trivialities.

By the end of the All-Union Conference the letter to I.V. Stalin had been adopted. Here is the piece of the verbatim report on the conference¹⁰:

"Chairman. There is a suggestion to send a letter to comrade Stalin (Applause). For reading the project of the letter Academician Chernayev is taking the floor. I.I. Chernayev reads the text of the letter to comrade Stalin (Prolonged applause). Chairman: The conference is adopting the letter unanimously (Prolonged Applause. The audience gives in honor of comrade Stalin a standing ovation)".

4.3. The case of Soviet quantum chemistry

In the West the criticism of the theory of resonance was connected with the competition of the two rival methods of quantum chemistry -the method of molecular orbitals and the method of valence bonds. As it is well-known, both these methods arose at the end of 1920s. The theory of resonance can be considered to be a branch of the method of valence bonds as this theory is based on the idea of this method, the idea of the formation of a chemical bond by coupling electrons. In organic chemistry the theory of resonance was not often distinguished from the conception of the method of valence bonds. However, the method of valence bonds is an approximative method of quantum mechanics and can provide the calculation of some properties of molecules. The theory of resonance is a qualitative version of the method of valence bonds, that equipped by some methods for semi-empirical calculations.

As early as 1930s E. Huckel compared the method of molecular orbitals and the method of valence bonds (the theory of resonance) by calculating the same molecular magnitudes within the frameworks of those methods. At the beginning of the 1950s a comparison like that was carried out by H.C. Longuet-Higgins.

The anti-resonance campaign passed by those attempts of scientific criticism of the theory of resonance. Having neglected purely formal remarks in some contributions, one can conclude that Syrkin and Dytkina were the

only persons who discussed the method of molecular orbitals at the 1951 All-Union Conference. However, they did it to justify themselves: they demonstrated that they had left the faulty theory of resonance out and devoted themselves to the method of molecular orbitals.

The anti-resonance campaign passed by one tendency more that had appeared in quantum chemistry by the end of the 1950s. This was a tendency to *physical* more sophisticated quantum chemistry. As the anti-resonance campaign concentrated on the politico-ideological attack on the theory of resonance, it was not interested in any scientific events in quantum chemistry.

Let me give some details. Syrkin and Dytkina developed the *chemical* quantum chemistry. They seemed to agree with L. Pauling, who called [1948, p. IX] to develop quantum chemistry by absorbing chemical conceptions. The theory of resonance and semi-empirical version of the method of molecular orbitals (Huckel's method), which they used, had been constructed in such a way. However, there was another tendency in quantum chemistry. One can observe this tendency by reading R.S. Mulliken and his co-workers' articles. R.S. Mulliken's school was oriented to more sophisticated quantum chemistry and carried out its research in good term with atomic physics and spectroscopy. As it is well-known, this school came to the well-founded treatment of the problem *molecular orbital is a linear combination of atom orbitals*. C.C.J. Roothaan, Mulliken's disciple, provided such a treatment by establishing his equations in 1951. A little earlier Parr and Mulliken [1950, p. 1346] made a step in this direction and wrote in their article devoted to the calculation of the energy of the molecule of Butadiene that *our results should be at least semiquantitatively correct (...) and so may be regarded as a 'go' sign for work with LCAO SCF method for other molecules*. LCAO SCF method means the method of calculation of the energy of molecules by means of the resolution of molecular orbitals into linear combinations of atom orbitals and procedure of self-consistent field. LCAO SCF method leads to the Roothaan equations.

Those who took Syrkin and Dytkina under criticism in the course of the anti-resonance campaign were not to be familiar with the current progress in quantum chemistry. It should be noted that Syrkin and Dytkina seemed not to be either in good terms with *physical* quantum chemistry, which Mulliken and his school had been elaborating. Speaking at the meeting of the commission of the Department of Chemical Sciences of the USSR Academy of Sciences and the All-Union Conference, they pessimistically evaluated the resources of quantum calculations in chemistry: They considered that these resources had been exhausted.

This pessimism had not been resulted only from their moral suppression. Quantum chemistry of their orientation came to a crisis at that time, and they did not see a way out.

It is interesting that in the course of the debate about resonance nobody said a word against this pessimism. Moreover, the chemists who had an antipathy to quantum mechanics and quantum chemistry were in a hurry to express their solidarity with Syrkin and Dytkina's pessimism. The physicists that participated at the 1951 All-Union Conference were not agreed with Syrkin and Dytkina at this point, but they could not say anything new: the Mulliken-Roothaan trend in quantum chemistry lied outside the Soviet quantum physicists.

Although the anti-resonance campaign passed by the actual problems of quantum chemistry, it did damage quantum chemistry in the USSR. First of all, the anti-resonance campaign did damage quantum education of Soviet chemists. *Our students had not been properly instructed (...) as a result of this campaign*, said Academician Kabachnik¹¹.

Indeed, after the 1951 All-Union Conference Syrkin and Dytkina's book *Chemical Bond and Structure of Molecules* and Russian translations of the books by Pauling and Wheland were denounced and removed from higher education. Education in chemical institutions came to be based on the pre-quantum chemical electronic theories.

The two Reutov books *The Theoretical Problems of Organic Chemistry* (1956) and *The Theoretical Foundations of Organic Chemistry* (1964) provide examples of such a treatment of the structure of molecules. Reutov regarded in those books Butlerov's classic theory as the foundation of theoretical organic chemistry. The electronic theories were considered by him to be a kind of building on Butlerov's theory. Reutov attempted to enrich the classic theory by adopting within its framework the electronic ideas, and to elucidate on the base of the enriched classic theory some problems of quantum chemistry.

Reutov came, however, to the well-known situation *old skin and young wine*. The classic theory of the structure of molecules led him to the opposition to quantum chemistry and the misinterpretation of some problems. Reutov could not accept unconditionally the many-formulas representation of the structure of molecules of a chemical compound, that was implied by the theory of resonance and quantum chemistry in general. As it was mentioned above, he considered that *element or subjectivism* had been introduced into chemistry by the theory of resonance.

Academician A. Berg estimated the USSR lag in cybernetics due to anti-cybernetics campaign as twenty years that had passed before Norbert Wiener's *Cybernetics* was translated into Russian. Similarly, the anti-resonance campaign prevented the translation of many works into Russian. One of the most vivid example was Ch. Coulson's *Valence* [1951], that was well received in the West and marked a new step in quantum education of chemists. In the USSR it appeared 14 years later [1965] than it was first published in Britain.

Why did the events take this course? At that time the theory of resonance was an inalienable part of quantum chemistry. It was impossible, therefore, to separate them. That is why, from the politico-ideological point of view, quantum chemistry looked as suspicious.

Coulson was neither the founder nor a proponent of the theory of resonance. His book was not translated into Russian because he used the theory of resonance together with other theoretical conception of quantum chemistry.

Quantum chemical education in the USSR had changed for better by the beginning of 1960s. The anti-resonance campaign had come down to naught by that time.

5. The end of the anti-resonance campaign

Bykov and Graham are right in emphasizing that after the 1951 All-Union Conference the anti-resonance campaign begun to decline. To improve the report prepared by the commission of the Department of Chemical Sciences, presented at the conference by Academician Terenin, a new commission, with Nobel prize winner N.N. Semenov (1896-1986) as chairman, had been organized. Although this commission was concerned with the problem how to connect the denunciation of the theory of resonance with other topics of *ideological struggle*, philosophers were not included in its stuff and were not even invited to participate at the session of the Department of Chemical Sciences to discuss the results of the commission work.

The commission had not developed the attack on the theory of resonance and its adepts. As it was instructed by Academician Nesmeyanov, its aim was to present in Terenin's report the position of the majority of participants at the 1951 All-Union Conference, that is, to combine Terenin's report and the resolution of the Conference.

At the 1953 session of the Department of Chemical Sciences of the USSR Academy of Sciences the paper *The State of the Theory of Chemical Structure in Organic Chemistry* prepared by Semenov's Commission was approved. This paper was published in 1954.

N.N. Semenov, who had ignored the anti-resonance campaign and did not take part at the 1951 All-Union Conference, explained his position as chairman of the Commission in such a way:

"There is a distribution of duties among the members of the Bureau of the Department of Chemical Sciences of the Academy of Sciences. I am curator of the problem of chemical structure. That is why I am chairman of the commission, namely chairman but not head"¹².

By the end of the 1950s politico-ideological criticism of the theory of resonance almost disappeared from Soviet books and articles on organic chemistry. But namely almost. O. Reutov, in his 1964 book on theoretical organic chemistry, wrote about *elements of subjectivism* which had penetrated into organic chemistry with the theory of resonance. However, Reutov's remark was a kind of relic. In 1958 L. Pauling was elected a Honorary Member of the Academy of Sciences of the USSR and his papers on the theory of resonance began to be published in the USSR. At the beginning of the 1960s the theory of resonance came back implicitly and explicitly to Soviet organic chemistry.

At the beginning of the 1960s the victims of the antiresonance campaign (Syrkin and Dytkina) restored completely their positions. As a matter of fact, their articles were sporadically being published in scientific journals after the 1951 All-Union Conference. But by the beginning of the 1960s the publication of generalized articles in the most authoritative journals had become available for them, and they had begun to deliver lectures at universities and colleges.

A few philosophical writings in which the theory of resonance was denounced as idealism and/or mechanism appeared after the 1951 All-Union Conference (by B.M. Kedrov, M. Shakhparonov, Y. Zhdanov). But those writings did not influence actually the work in chemistry. What influenced this work was the development of the theory of molecular orbitals, which supplanted the theory of resonance at the top of theoretical organic chemistry.

6. Conclusion

The phenomenon of the religious rite in science manifested itself in the anti-resonance campaign. This campaign had no actual controversy in its base, was not in touch with real problems of science, did not result in any considerable shift in the administrative body. But it met all the attributes of the politico-ideological debate held in Soviet science: many chemists gave themselves access to dialectical-materialism ideology, many denunciations of the theory of resonance appeared in scientific journals and mass-media, the All-Union Conference with participation of prominent scientists and repentance of the adepts of the theory took place.

NOTES

- 1 ADAMS [1980, p. 194].
- 2 NARSKY & SUVOROV [1961, p. 73].
- 3 The Leningrad Theoreticians Meeting... [1950].
- 4 An Interview...
- 5 The State of the Theory of Chemical Structure [1952, p. 308].
- 6 An Interview...
- 7 The Protocols... [1950-1951].
- 8 The Leningrad Theoreticians Meeting... [1950].
- 9 The Session of the Department of Chemical Sciences [1951].
- 10 The State of the Theory of Chemical Structure [1952, p. 370].
- 11 An Interview...
- 12 The Session of the Department of Chemical Sciences [1953].

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