

Construction History in the Soviet Union - Russia 1930-2005. Emergence, Development and Disappearance of a Technical Discipline

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In view of the current interest in construction history as a new area of interdisciplinary research, it seems important to become acquainted with the work that has been carried out in this field. Construction history as an independent scientific discipline is of rather long duration in Russia and is directly linked to the specific nature of the state-sponsored development of academic scholarship and new applied research areas during the Soviet period. Becoming acquainted with this work broadens one's understanding of the history of science and technology in the twentieth century, and integrating the Soviet experience into current general European research begins to serve as the basis for further work.

CONSTRUCTION HISTORY AS AN ELEMENT OF NATIONAL CONSCIOUSNESS: 1933 - 1956

The previously unseen scale of the construction undertaken in the Soviet Union during the first five-year plan for the country's industrialisation (1928-1933) made the building industry one of the most important areas in the programme for the socialist transformation of the national economy (Khazanova, 1980; Volchok, 1980). The All-Union Academy of Architecture of the USSR was created in 1933 in order to solve new problems relating to construction and architecture. The Academy, under its original charter, was a scientific-research and higher educational institution in the field of architecture and construction and supplemented the activities of the USSR Academy of Sciences.

The main goal of establishing the Academy was linked to the ideologically motivated review of the creative tenets of Soviet architecture and the emergence from the "cosmopolitan" period of the 1920s, and the beginning of the 1930s. As in a number of European countries, the architecture of the radical avant-garde period (today well known as the high point in the development of Russian architecture - e.g. Cook, 1995) was subjected to a basic revision in these years. The newly created Academy viewed the new tasks in the field as "moving architecture away from bare technicism and striving to create authentic artistic expressiveness combining lofty ideological content with functional truth". The task of "adopting the cultural heritage of the architecture of the classical periods and creating on that basis the new artistic language of Soviet architecture" (The Ten Years of the Academy 1944, p. 8) assumed fundamental importance in educational and scientific activities. Therefore, the new Academy's work programme from the beginning provided for a

thorough study of the historical aspects of the experience of the peoples of the USSR and other countries in the field of architecture and construction.

In its structure and the names of its departments, the new Soviet Academy in its initial stage (1933-1941) clearly gravitated towards recreating the structure of the European academic institutions of the previous centuries. Scientific research was conducted in "offices" ("кабинеты"). In addition to the architectural offices (theory, history, the scientific bases for architectural design according to building type) set up in 1934, offices dealing with the development of the technological aspects of architecture - industrial construction/buildings, decoration and ceramic work as well as building technology in general (under the direction of A. V. Kuznetsov) - were opened here in the first years of the Academy's work. The Academy's structure also included an architectural museum, a library, a doctoral programme and its own publishing house.

The task of the Office of Building Technology was "to assist in introducing the best achievements of construction technology into architectural design and construction and to find new, highly rational and economical structural elements" (Ten Years of the Academy 1944, p. 45). The basis of its work during the Academy's initial stage was the study of the history of building technology and the experience acquired in that field. This can be seen in particular in the titles of the first scientific research works, which include such topics as "Construction Technology of the Renaissance up to Alberti", "Structures and the Development of Architectural Forms", "Wooden Domes", "Rigid Frames and the Structures of High-Rise Buildings (all in 1934); "The Technical Bases of Architectural Forms", "The Architectural and Structural Qualities of Reinforced-Concrete Frame Structures" (all in 1935); as well as a number of others. During the pre-war period, the Office of Building Technology published diverse materials analyzing general principles in the development of building structures ranging from the stone arches of Central Asian architecture and the wooden ceilings of Russian classicism to complex metal structures and others (Ten Years of the Academy 1944, pp. 45-46, 84-96; see also References).

The active construction work in the period of industrialisation and the studies carried out by the Academy of Architecture as the country's new scientific centre for knowledge in the field of architecture and construction, had already in the 1930s clearly influenced the introduction of new academic courses, particularly those elucidating the concepts and development of building technology. For example, in 1935 the Moscow Civil Engineering Institute published the first textbook on construction history for higher engineering academic institutions (Milonov 1937). Prior to this, in spite of individual books and textbooks on the history of construction (Petrov, 1869; Radivanovsky, 1916; Kuznetsov, 1930 et al.) questions relating to construction history were hardly given consideration in higher engineering schools.

The outbreak of the Second World War radically changed the thematic content of the Academy's work. On a decision by the Government, it was evacuated to Chimkent in the Kazakh SSR. Owing

to their constant expansion, the offices, starting in 1940, began to serve as the basis for scientific research centres that were beginning to be set up. The Office of Building Technology was transformed into an institute with the same title in 1942. Work in the field of building technology focused on developing new structures for the rapid assembly-line production of prefabricated houses and urgent questions relating to the large-scale evacuation of industry to the country's eastern regions. It is interesting to note that the war temporarily changed the critical attitude regarding "Western" science and practice that was already evident in Soviet research in the 1930s and the tendency to affirm national priorities in the development of new scientific areas. For example, in analysing questions relating to housing construction, the Institute of Building Technology at that time actively drew upon American experience in low-rise standardised construction. The frameless residential buildings developed here from factory panels on the basis of plywood and aluminium insulating material to a large extent followed the principles used in American construction, in particular the Package House System of Konrad Wachsmann and Walter Gropius (1939-1945). At the same time, under the supervision of A.V. Kuznetsov the compilation of a catalogue of industrial building materials and products "on the model of the American SWIT catalogue" (Ten Years of the Academy, p. 18) was begun.

After the victory in the Second World War, during the latter half of the 1940s, the research by the Academy of Science and the Academy of Architecture displayed an increased tendency towards a general affirmation of the priority of Russia in developing science and technology. Paradoxical as this may seem, today it can be said that achieving this completely ideologized task of Stalin's internal policy made it possible to write a number of works on the history of the main areas of Russian technology. They were begun by the Academy of Science in the 1930s within the framework of the work of the "Commission on the Marxist History of Technology". The Commission defined for a long time the methodological bases for considering the development of technology, which up to the 1980s was immutably linked to the interpretation of history that was traditional for historical and dialectical materialism through the prism of the succession of "socio-economic systems". The need to follow this approach is demonstrated by the titles of the first studies by the USSR Academy of Science begun in the 1930s (Milonov, 1934; Mitkevich, 1936).

In the period after the Second World War, the "Academy of Science's Commission on the History of Technology" continued the work of its predecessor. In addition to work with archive and printed sources, expeditionary studies were conducted for the first time on the concrete sites in Siberia, the Urals and the Altai region. The results were published in the work "Russian Technology", presented as "the first consolidated study devoted to the creativity of the Russian people in the field of technology" (Danilevsky, 1948, p.3). The book was published twice in the course of two years (**fig. 1**). Written at the height of the infamous period of Soviet post-war history known as the "struggle against cosmopolitanism", the monograph is characterized by an artificially overstated "patriotic" orientation. This can be seen from the very titles of individual sections - "Russian metal", "Russian technology", "Russian mechanics" and so forth - which nevertheless also contain exhaustive new

Institute on the Theory and History of Architecture and Building Technology in Moscow (from 1963 on widely known as the Central Institute on the Theory and History of Architecture or ZNIITIA). At the same time, research on construction history was also conducted in a number of higher educational institutions in the field of construction. General questions relating to the history of science and technology remained the province of the Institute on the History of Natural Science and Technology of the Academy of Sciences and its branches. In the second half of the 1950s, a number of thematic collections of scholarly works were prepared and produced. Published by both the Academy of Sciences (Kuznetsov, 1956) and the Academy of Architecture (Lyudvig, 1961), they differed little in content, continuing to gather material on Russian technology, with an obvious emphasis now on the development of construction materials, the typification of construction, and industrial archaeology.

A real qualitative leap forward in studying the history of science and technology in the Soviet Union occurred at the beginning of the 1960s - at the height of a new period of Soviet political history. At this time, most of the topics that had been dealt with in previous decades were taken to the logical conclusion possible under the circumstances. The results were published in the form of exhaustive monographs that explained in detail the development of a number of the main branches of the history of science and technology. An initial acquaintance with a bibliography of Soviet publications on the subject (see References) shows that, from the end of the 1950s, books, textbooks and collections of articles appeared within short intervals on the history of the strength of materials (Timoshenko, 1957), structural mechanics (Bernshtein, 1957), architecture (Michailov, 1958/1963), mechanical engineering (Chekanov/Sokolsky, 1961), mathematics and mechanics (Grigoryan, 1963) and a number of others as well as two general monographs on the history of technology and the history of building technology - without which the presentation of this paper's topic would hardly have been feasible.

It should be pointed out that all the works that appeared in these years had been largely freed from the ideological conventions of the previous decades, particularly the defence of national priorities as goals of historical research. Nevertheless, they obviously did not pursue the task of reviewing or expanding their methodological basis, which essentially remained unchanged since the 1930s even during the new period of history.

The most complete Soviet monograph on the history of technology appeared in 1962, intended as a comprehensive scholarly exposition of the topic (Zvorykin, 1962). Referring to previous publications, the preface alludes to the equally well-known national monograph on the subject (Danilevsky, 1948), and the five-volume "History of Technology" published in England, which, as claimed by the authors, contained obvious methodological discrepancies in the definition of basic concepts. Despite its presentation, which today seems gratuitously ideologised - four parts of the work corresponded to the separate "socio-economic stages" in the development of society and their "modes of production" - the monograph contained clearly structured material which provided a

comprehensive view of the development of the main fields of technology and the contributions of individual countries in that regard. Beginning with an overview of simple work tools in primitive societies, the book ends with the appearance of nuclear technology. The final chapter dwells on the problems of the social consequences of the development of technology. In each section, together with the technology of handicrafts, agriculture, mining, metallurgy, mechanical engineering and others, the general evolution of the corresponding building technology is also considered.

A no less exhaustive study on construction history (Ivanov, 1962) appeared at practically the same time as the general work on the history of technology. Presented as the first textbook for higher educational institutions in the field of civil engineering, the book, which contains 560 pages and was printed with a run of 12,000 copies, remains the most comprehensive attempt to expound the main aspects of construction history as an independent technical discipline. Participation as reviewers by staff members of the Institute on the Theory and History of Architecture and Building Technology most probably helped to develop the book's structure, which relates to the problems of building technology without touching upon questions concerning architecture and other plastic arts (**fig. 2**). The authors of the textbook were professors and teachers from one of the country's oldest educational institutions - the Leningrad Institute of Civil Engineering (founded in 1832): V. F. Ivanov, N. N. Aistov, K. V. Sakhnovsky, N. A. Smirnov and S. M. Shifrin, who were the country's leading specialists at that time in the field of metal, wooden and reinforced-concrete structures and foundations as well as construction management.

The textbook *History of Building Technology* combines traditional Soviet historiography and a comprehensive analysis of the development of the most important types of structures, building materials and construction works in contemporary building industry. The first section of the book surveys the development of building technology from primitive society up to the beginning of the 18th century. Its main part provides materials illustrating construction practice in the ancient world. The second part of this section explains the development of building technology in Russia from the first information derived from chronicles to the start of the 18th century - the point marking the beginning of the radical political and economic reforms of Peter I. Subsequent chapters deal in sequential order with the appearance and development of wooden, stone, wrought iron and steel and reinforced concrete structures (**figs. 3 and 4**). Individual chapters deal with the development of earthworks, the building of foundations and, in conclusion, the development of decorative techniques and sanitary engineering. Bridge building and hydraulic structures - traditionally independent fields of engineering - were deliberately excluded from consideration. An exhaustive bibliography was included at the end of each chapter.

The preparation of such an "encyclopaedic" research study gave its authors the opportunity to put forward the contemporary view on the development of the main fields of building technology and, to some extent, construction science. The book's merits include an attempt to depict building technology as an independent field of knowledge and to propose the basis for systematising it, with

Раздела первый
ИСТОРИЯ СТРОИТЕЛЬНОЙ ТЕХНИКИ
С ДРЕВНЕЙШИХ ВРЕМЕН
ДО НАЧАЛА XVIII ВЕКА



Глава первая
СТРОИТЕЛЬНАЯ ТЕХНИКА ПЕРВОБЫТНОГО ЧЕЛОВЕКА

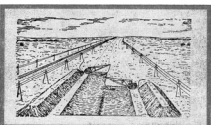
Многочисленная человеческая культура связана с развитием строительного дела, которое является одним из проявлений человеческого труда.

С тех пор, как появилось человек, появилось труд, появилось и строительство, в процессе которого человек получает себе природу, накапливает на нее печать своей воли, своего ума.

«Первый исторический акт... — говорит К. Маркс и Ф. Энгельс, — человек обрывает зависимость, благодаря которой он оказывается от животного, состоит не в том, что он мыслит, а в том, что он начинает производить себе средства к существованию».

— К. Маркс и Ф. Энгельс, Новая коммунистическая, стр. 10.

Раздела второй
РАЗВИТИЕ СТРОИТЕЛЬНОЙ ТЕХНИКИ
ЗЕМЛЯНЫХ РАБОТ



Земляные работы, с которых обычно начинается строительство различных зданий и сооружений, являются одними из наиболее трудоемких работ в строительстве.

История производства земляных работ (копание и перемещение грунта) насчитывает многие тысячелетия. Первые земляные работы связаны были с постройкой жилищ, укреплений, дорог.

Для устройства своего жилища первобытный человек пользовался при помощи каменных орудий. Такие же примитивные орудия применялись на земляных работах при закреплении укреплений, для выемки почвы и т.д., которые в ряде случаев достигали больших размеров. Длительными памятниками таких земляных сооружений являются гробницы в Египте и других странах, а также поребрики дорог у восточных славян. Среди последних особенно выделяется

Раздела третий
РАЗВИТИЕ ФУНДАМЕНТОСТРОЕНИЯ



Всякое сооружение имеет фундамент, который необходим для прочной и надежной установки сооружения на грунт (рис. 1). Опереть сооружение на мягкую поверхность грунта в общем случае не всегда представляется возможным, так как величина его сил в большинстве случаев является слишком большой. Она превышает допустимую прочность грунта, замораживание, а многие из них подвержены пучению. Кроме того, до некоторой степени может сказаться неравномерное оседание фундаментов. Между этой грубой и внешней поверхностью оказывается промежуток, который и является особой частью конструкции сооружения, называемой фундаментом.

Целью фундамента является передача нагрузки на грунт. Однако, несмотря на то, что фундамент является частью сооружения, он имеет свои особенности, которые являются особенностями. Известно лишь то, что русский строитель, а именно, Витрувий, живший в I в. до н. э., в труде «Десять книг об архитектуре» применяет термин

Figure 3. Ivanov 1962: title pages of sections 1, 2 and 3 (Construction History up to the 18th Century; The Development of Earthworks; The Development of Foundation Engineering)

Раздела пятый
РАЗВИТИЕ КАМЕННЫХ КОНСТРУКЦИЙ
С НАЧАЛА XVIII ВЕКА



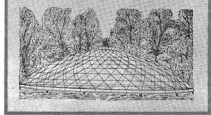
Глава первая
РАЗВИТИЕ КАМЕННЫХ КОНСТРУКЦИЙ В XVIII ВЕКЕ

Начало XVIII в. характеризуется усилением развития капиталистической экономики во всех крупных странах Европы. Это отразилось на первых порах складывавшихся в процессе перехода от ремесла к мануфактуре, развивавшихся еще в XVII в. в Италии, который начал много заимствовать в Нидерландах, Франции, Англии и в других странах.

В начале XVIII в. в Европе была создана мануфактура, насчитывавшая 13 тыс. станков. Швейцарская мануфактура Вав-Рубе в среднем вела обихода 1200 принадлежала, в черном металлургии в Кельне в это время насчитывалось 5000 работ. Быстро росли крупные промышленные предприятия в Манчестере, Шеффилде, Ньюкасте, Эверестоне, Ливерпуле и других городах.

— История строительства

Раздела шестой
РАЗВИТИЕ МЕТАЛЛИЧЕСКИХ КОНСТРУКЦИЙ



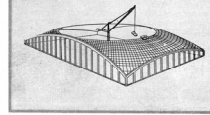
Железо, в отличие от других металлов, за исключением метеоритного железа, почти не встречается в природе в чистом виде. Это связано с тем, что железо является самым распространенным металлом. Это связано с тем, что железо является самым распространенным металлом.

Металлическое железо, несмотря на его исключительную прочность, было известно человеку с глубокой древности, о чем свидетельствуют различные находки, найденные в Египте, Греции, Индии, Китае и т.д.

Способ производства железа и руды был открыт лишь во II тысячелетии до н. э. С этого периода металлургия железа начала широко распространяться в Египте, Месопотамии (Вавлонии, Ассирии), а затем в Индии, в древнем Китае, Малую Азию и Закавказье железо и способ его производства проникли в конце II в. до н. э. в Грецию, Рим и т.д.

В древние времена железо добывалось из бурых железняков, содержащих большое количество примесей, поэтому металл получали не чистым, а в виде сплава с углеродом, который и называется чугуном. Превращение раздробленной руды в металл, получаемый при открытии огня, а затем в металл, является, в целом,

Раздела седьмой
РАЗВИТИЕ ЖЕЛЕЗОБЕТОННЫХ КОНСТРУКЦИЙ



Глава первая
ВОЗНИКНОВЕНИЕ ЖЕЛЕЗОБЕТОННЫХ КОНСТРУКЦИЙ

Железобетонные конструкции по сравнению с конструкциями из других материалов (камень, дерево, сталь) являются новыми. В строительстве они появились только во второй половине XIX в. Однако, несмотря на это, железобетон получил широкое распространение в строительстве и имеет свою историю и своих выноских деятелей.

Когда начали появляться первые железобетонные конструкции и кому принадлежит первая мысль выноских проволочного каркаса в массу цементного бетона, точно не известно. Первые железобетонные конструкции встречаются в середине прошлого столетия. Так, около 1850 г. француз Ламби изготовил лодку из проволочной сетки, обжатой в обожженный кирпичный раствор, который затем была выложена на железной поверхности в Париже в 1855 г. Одна из этих же работы выложена Хайт уже проводила опыты с армированным бетоном и дал описа-

Figure 4. Ivanov, 1962: title pages of sections 5, 6 and 7 (Stone Structures since the 18th Century; Metal Structures; and Reinforced-Concrete Structures)

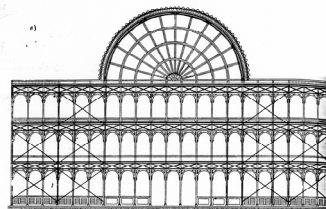
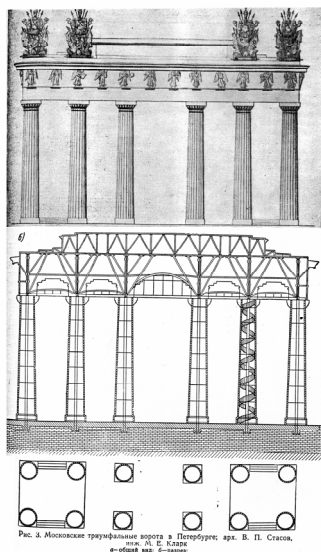


Рис. 5. Хрустальный дворец на Всемирной выставке в Лондоне в Гайд-парке; проект Джозефа Пэкстона

На конкурс было представлено 240 проектов, однако ни один из них не удовлетворял поставленным условиям. И лишь 241-й проект, представленный садоводом Джоузефом Пизеттоном, специализировавшимся на постройках оранжерей, удовлетворил комиссию, так как он обеспечивал все условия конкурса и позволял в случае надобности быстро разобрать сооружение.

Главное здание выставки заняло в Гайд-парке огромную площадь в 60 га, простиравшуюся в длину на 663 и в ширину на 12,5 км. Это составило из себя холмов, нефей (эвг.) средн. ширин. 36,6 м, имел высоту 20,7 м, по периметру этого нефа располагались трехэтажные галереи; оседние нефы, примыкающие к двум сторонам к среднему нефу на высоту двух этажей, имели ширину по 22 и высоту 12,8 м; крайние односторонние нефы имели ширину также по 22 м, но высоту 6,7 м. Торцовая стена здания четко обрисовывалась своими уступами пять

Последние здания продольные нефы прерывались поперечным нефом (трансептом) шириной 22 и высотой 32,9 м, перекрытым цилиндрическим остекленным сводом, образуемым отдельными арками (рис. 5, в). С

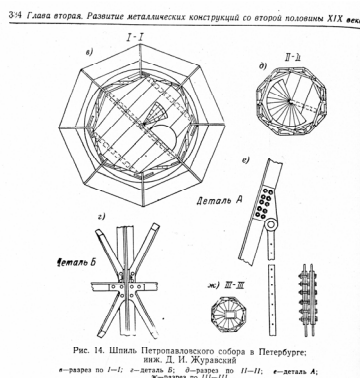
Общая длина трансепта по его оси равна 139 м.

Все здание представляло собой выходящее инженерное сооружение, возведенное из чугуна, железа и стекла. В этом здании, по-видимому, впервые была полностью применена модульная система планировки.

и стандартизированным отдельные детали конструкции. Модуль расстановки колонн в продольном и поперечном направлениях был принят одинаковым и равнялся 7,33 м. Для получения более крупных пролетов, например нефов, принимались кратные 7,33 м размеры в 14,66 и 21,99 м, т. е. кратные 3,11 м, что обеспечивало в нефовой системе шаг колонн 3,11 м.

что хорошо сочеталось с шагом колонны в окружающих нефы галереях.

Figure 5. Ivanov 1962: section of *Metal Structures* - development up to the middle of the 19th century
(example of presentation of material – pp. 313, 318)



колес и крестовых, агональных связей в плоскостях поверхности стержней пирамиды. Ребра составлены из двух уголков, расположенных тавром и соединенных между собой болтами. Стяжки уголка по длине делались в шахматном порядке поперечные длины смежного уголка. По высоте шляши расположено 39 колец, расстояние между которыми колеблется от 10 до 15 см. В центре каждого кольца вварены стержни, соединяющие кольца — из полосового железа. Раскосы между ребрами и кольцами шляши изготавливались из полосового железа с отогнутыми по концам лапками для более удобного соединения стержней в узлах конструкции. До упрочнения металла 13 и 14 кольцами идет винтовая лестница диаметром 10 см, которая является снаружи шляши по способу, как на рис. 1, для выхода наружу устроен люк.

Шпиль привхвачен к колокольне восемью анкерами диаметром 6 см, пропущенными внутрь кирпичной кладки от остоного кольца шпиль на глубину до 15 м и к восьми дополнительными открытыми связями, расположенными внутри колокольни. Эти связи, сделанные из полосового железа сечением $8,89 \times 2,54$ см, верхними концами крепилась к ребрам шпиль между вторым и третьим кольцами, а внизу посредством хомутов захватывали двутавровые клепаные балки высотой 0,73 м. Балки, заделанные концами в кирпичную кладку ступ колокольни на 18 м ниже основания шпиль, создавая надежное закрепление связей.

Анкера и открытые связи рассчитывались раздельно с таким предположением, что если анкера, заделанные в стены, с течением времени

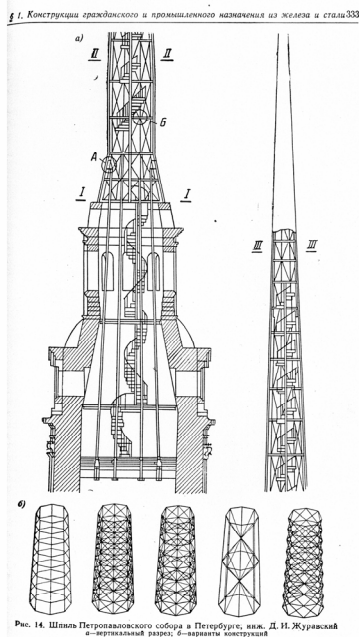


Figure 6. Ivanov 1962: section of *Metal Structures* - development in the second half of the 19th century
(example of presentation of material – pp. 333, 334)

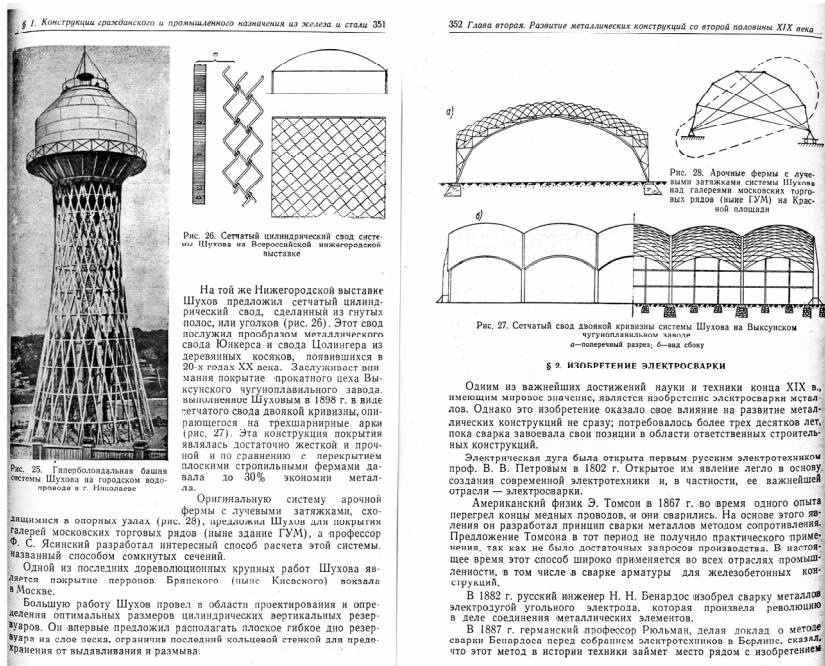


Figure 7. Ivanov 1962: section of *Metal Structures* - engineering and industrial structures of the end of the 19th century (example of presentation of material – pp. 351, 352)

Two years after the publication of *The History of Building Technology*, a new work on the same subject appeared on the Soviet market (Miloslavsky, 1964). The preparation of two largely identical publications within the centralised planning system for book production illustrates the official interest in popularising the topic of "construction history" in the Soviet Union in the 1960s. The new book essentially provided a simplified version of the first textbook and was also presented as a textbook for secondary educational institutions - technical schools for architecture and construction. The main section of the book, dedicated to "building technology and architecture in the USSR", represents an attempt to find a new way of presenting materials on construction history. Each chapter in this section first shows the state of building technology during a specific period. This is followed by a description of the architecture corresponding to each period through the prism of building technology.

The dynamic development of construction practice in the Soviet Union in those years and the evident convergence of the principles of "post-Stalinist" architecture with those of post-war Western Europe were accompanied by structural changes in the organisation of construction science. In 1963, the Academy of Architecture and Construction (its very name sounded more than antiquated at that time) was abolished. The many design and research institutes attached to it were transferred to Gosstroj (having the functions of a federal ministry of construction) and a number of

its Committees, primarily the State Committee for Construction and Architecture. The organizational changes at the beginning of the 1960s did not fundamentally affect the subject matter dealt with in the work of individual institutes. The study of "the achievements of, and prospects for the development of building technology" continued to be among the main areas of the scientific research carried out by the Committee on Construction and Architecture concerning the "theory of Soviet architecture" (Zavorykin, 1981, p. 168).

Developing the research of earlier years, in 1964 the Scientific Research Institute on the Theory and History of Architecture and Building Technology published *Studies on the History of Building Technology in Russia in the 19th and the Beginning of the 20th Centuries* (Lyudvig/Vlasyuk, 1964). Prepared in the traditional form of a collection of articles on the topic, this publication today remains one of the best-known works on construction history published in the Soviet Union (fig. 8). The collection consists of two parts, which correspond to the two historical periods of the "development of capitalism" in Russia: 1800-1861 and 1861-1914. The temporal demarcation indicates a major historical milestone linked to the intensive urbanization of Russia following the emancipation of the peasants. The correlation between the industrial revolution and the structural and technical basis of architecture in Russia was in actual fact first revealed through extensive new material primarily from the little known areas of industrial construction and engineering structures.



Figure 8. Lyudvig/Vasyuk 1964: cover and section title pages

The reason for the book's success was the felicitous combination of construction history with research on new architectural and theoretical issues. The architecture of the second half of the nineteenth and the beginning of the twentieth centuries was related to them from the viewpoint of an analysis of Russian architecture. The analysis of the correlation between structures and architectural form, however, became even more important in those years. The relevance of this

question increased the broad interest of professional circles in the development and study of new areas in architectural and construction practice - "spatial structures" (Morozov, 1977). Extensive work on the subject of spatial structures, which had been actively expanding for almost 30 years, gave rise to a number of new architectural and technological questions, and the search for answers to them significantly broadened the terms of reference of construction history in the Soviet research institutes of that time.

BUILDING TECHNOLOGY AS A SUBJECT OF THEORETICAL RESEARCH - BETWEEN THE HISTORY OF ARCHITECTURE AND AN ANALYSIS OF THE DEVELOPMENT OF CONSTRUCTION SCIENCE: 1970-1990

The final two decades of the Soviet period were characterised by the complete shift of research on construction history to the sphere of activities of the scientific research institutes of the State Committee on Construction and Architecture. The section dealing with the technical problems of architecture of the Central Research Institute on the Theory and History of Architecture (ZNIITIA) in Moscow (under the direction of Y. S. Lebedev) coordinated and supervised the work being conducted, in which institutes in Leningrad and Kiev also participated. Accordingly, research topics increasingly focused on such subjects such as the architecture of the second half of the nineteenth and the beginning of the twentieth centuries, the link between structures (technology) and architectural form as well as an analysis of the early stages of Soviet architecture.

Unlike the work carried out during the 1950s and 1960s, the new research, while remaining within the bounds of "Marxist methodology", was already focusing on a comprehensive (historical, sociological and philosophical) understanding of the technological innovations in construction. Assessing the role of technology in the development of architecture, it sought to shift away from the simplistic schematisation of the impact of science and technology on architecture. Instead of the traditional "historical evolutionary" consideration of the problem, an "historical-logical" model for research was put forward, which was to be more in accordance with the complex processes in the "creative synthesis" of building technology and architectural designing (Lebedev, 1977, pp. 3-9). The collective monographs *Structure and Form in Russian Architecture of the 19th and the Beginning of the 20th Centuries* (Lebedev, 1977) and *Structure and Form in Soviet Architecture* (Volchok, 1980) were among the first such studies. They both underscore the novelty of the presentation of questions relating to an understanding of the acceptance of building technology in architectural practice and at the same time in the public consciousness. These works also highlight the links between the development of the structural basis of architecture and the state of the science as a whole (Volchok, 1980, pp. 7-44).

Similar questions were also dealt with in the works on the history of the organization of science which appeared in the Soviet Union in the 1980s. The new "system-based" approach focused its attention almost immediately on construction science also. The monograph *The Development of*

Construction Science in the USSR was devoted to analyzing it, seeking to conduct "a comprehensive analysis of the basic stages in the development of construction science in its main areas and primarily during the years of Soviet power" (Zvorykin, 1981, p. 3). The basis for research, as the bibliography specifically indicates, was mainly domestic publications on construction history that appeared after the mid-1950s. By placing them in the context of socio-political development, the author created an original work, which can be ranked among the important and little-known books on the history of science and technology in the Soviet Union (fig. 9).

21613

Д.Н.ЗВОРЫКИН

РАЗВИТИЕ СТРОИТЕЛЬНОЙ НАУКИ В СССР

ОГЛАВЛЕНИЕ

Введение	3
ГЛАВА I. ПЕРВЫЕ ШАГИ РАЗВИТИЯ СТРОИТЕЛЬНОЙ НАУКИ	7
1. Зарождение науки в царском строительстве	7
Периодико-общий строй	10
Рационализация	10
Фабричное общество	12
Капиталистическое общество	12
2. Развитие строительной науки и техники в дооктябрьской России	31
3. Строительство науки и техники в условиях перехода к развитию капитализма в России	53
Строительная наука	55
Деревянные конструкции	60
Каменные конструкции	63
Железобетонные конструкции	65
Металлические конструкции	75
Бетонные и железобетонные конструкции	75
Нормативная техника, машины, техника и фундаментостроение	83
Организация строительства	85
Техническое нормирование	85
ГЛАВА II. РАЗВИТИЕ СТРОИТЕЛЬНОЙ НАУКИ В ГОДЫ ПЕРВЫХ ПЯТИЛЕТИЙ	60
1. Первые научно-исследовательские организации и их роль в восстановлении народного хозяйства	88
2. Основные достижения строительной науки в годы первых пятилетий	102
ГЛАВА III. РАЗВИТИЕ СТРОИТЕЛЬНОЙ НАУКИ В ГОДЫ ВОЙНЫ И ПОСЛЕВОЙННЫЙ ПЕРИОД	136
1. Разработка основ теории и практики индустриального строительства	136
2. Строительная наука в годы индустриализации капитального строительства	163
ГЛАВА IV. СТРОИТЕЛЬНАЯ НАУКА НА СОВРЕМЕННОМ ЭТАПЕ И ЕЕ РОЛЬ В НАУЧНО-ТЕХНИЧЕСКОЙ РЕВОЛЮЦИИ	192
1. Современная строительная наука — индустриальная производственная наука	192
2. Основные достижения современной строительной науки	195
Архитектура, градостроительство и районная планировка	195
Промышленное строительство	200
Жилищно-гражданское строительство	211
Сельскохозяйственное строительство	213
Строительная техника	218
Строительные материалы	219
Железобетонные конструкции	219
Металлические конструкции	225
Каменные и железобетонные конструкции	233
Легкие конструкции	234
Основания и фундаменты	237
Строительная физика	241
Строительная физика	241

Строительная синтетика	242
Строительная акустика	243
Организация, технология и механизация строительства	244
Автоматизированные системы и комплексная техника в строительстве	248
Экономика строительства	251
3. Современная сеть научно-исследовательских организаций и методы управления строительной наукой	255
ГЛАВА V. ПЕРСПЕКТИВЫ РАЗВИТИЯ СТРОИТЕЛЬНОЙ НАУКИ В СССР	266
1. Основные направления перспективного и комплексного развития строительной науки	266
Градостроительство и районная планировка	267
Промышленное и сельскохозяйственное производство, строительство	269
Жилищно-гражданское строительство	271
Строительные конструкции и методы их производства	277
Строительные материалы и машины	279
Техника, организация и механизация строительного производства	283
Управление строительством на базе использования вычислительной и организационной техники	285
2. Проблемы совершенствования организационных форм в методах управления строительной наукой	287
Список литературы	289

МОСКВА
СТРОИЗДАТ
1981

292

Figure 9. Zvorykin 1981: cover and table of contents of the monograph on Development of Construction Science in the USSR

Among the most informative sections of the monograph is the history of the origin of Soviet construction research and design organizations - from the establishment of the first State scientific institutions in 1918 to the completion, by the beginning of the 1980s, of the process of setting up a broad network of research institutes, educational institutions and laboratories in all fields of construction (Zvorykin, 1981, pp. 88-192). At the same time, the reader gained an understanding of the major stages in the development of calculation methods, building norms, the appearance of technological inventions and architectural controversies, as well as the research-engineer who defined the main areas of construction science at that time (N. S. Streletsky, V. Z. Vlasov, A. F. Lopeit, E. O. Paton, A. A. Gvozdev, N. M. Gersevanov et al.).

Close acquaintance with the monograph on the evolution of Soviet construction science enables one today to see the real mechanisms for the growth of the construction industry in the country. Under centralized State management free of market relations, it invariably followed the changes in the range of general socio-political tasks, which assigned construction the role of an active, but well

controlled, instrument for building the new society. As the book's extensive documentary material clearly demonstrates, throughout the advance of Soviet construction science the questions of the evolution of building technology and construction structures were viewed as a separate national economic issue. For this reason, in considering questions relating to the system-based development of science, Zvoryrkin's monograph also represented the most comprehensive survey of the progress of building technology in the Soviet Union since 1918, having in essence fully completed the almost 50-year cycle of research studies and publications in this field.

The end of the centralised funding of science following the collapse of the Soviet Union (1990-1993) led to the disappearance of the all-Union network of State institutions responsible for conducting research in individual branches of the national economy. Of the institutes that earlier dealt with questions concerning construction history, only two to date have retained that status - the Scientific Research Institute on the Theory and History of Architecture (ZNIITIA, Moscow) and the Academy of Science's Institute on the History of Natural Science and Technology (Moscow and a branch in St. Petersburg). Work on the subject of the history of building technology, however, has evidently lost its relevance in Russia at the present time and given way to efforts to fill in the numerous thematic and methodological lacunae in the general history of architecture and science history.

While there is obviously little demand for them within the country, Russian materials on construction history have recently begun to supplement Western European research on the subject. For example, at the end of the 1980s and the start of the 1990s, the Institut für Leichte Flächentragwerke of Stuttgart University (IL) launched a programme to study the engineering legacy of V. G. Shukhov, well-known for his pioneering studies in the first decades of the twentieth century in the field of light metal structures (Graefe, 1990). This work was continued through research conducted at Karlsruhe University on early Petersburg chain bridges (1883-1826) connected with the name of the Baden engineer Wilhelm Traitteur. It was followed by work on the European contacts of the Petersburg Corps of the Transport Route Engineers (founded in 1809 by Augustin Betancourt) connected with the name of the Bavarian engineer Carl Friedrich Wiebeking, which was conducted at the Munich East European Institute.

In addition to analytical studies on the subject of construction history and transfer of construction theories and experiences, the possibility of studying unique monuments of building technology in Russia has also given rise to considerable interest. Accordingly, over the past three years, Cottbus University of Brandenburg (BTU Cottbus, Werner Lorenz and el.) has been conducting projects studying the metal-strut beams and other iron roof constructions (1838-1845) of the Winter Palace buildings in Petersburg now comprising the State Hermitage Museum complex. We hope that one of the results of this international work in progress (one of whose stages is the subject of a separate paper at this Conference) will be the fully-fledged return to Russia of the contemporary variant of Construction History, a discipline whose emergence should really have obvious priorities for that country.

SUMMARY

- During the period from the 1930s through the 1980s, wide-ranging research was conducted in the Soviet Union on building technology within the framework of programmes carried out by a number of State institutes (the Academy of Architecture, the Academy of Architecture and Construction, the State Committee on Construction and Architecture and also the Academy of Sciences). The ultimate objective of this research work was the comprehensive development of the construction industry as the basis for building the new socialist society. The solving of new technical problems in the field of architecture was thereby accompanied by systematic research on *construction history* as an *independent part of construction science*.

- From the 1930s through the 1960s, construction history in the Soviet Union evolved from a subsidiary theme in architectural history and a basis for documentation that promoted the search for and development of new construction designs into *an independent area of technical knowledge*, which took its place between the civil engineering, the history of technology and the history of architecture (Ivanov, 1962; Miloslavsky, 1964; and Lyudvig/Vlasyuk, 1964). As a new scientific discipline, building technology developed its own methodology and sphere of application.

- *The methodological basis of building technology* as an historical discipline was defined by the postulates of one of the tenets of Marxism - historical materialism, which served as the immutable basis for all Soviet scientific work from the 1930s through the 1980s. Its principles essentially completed the evolutionary-positivist approach to considering individual aspects of man's material and spiritual activities founded by French philosophical empiricism and continued under nineteenth-century European rationalism (Gr. Y-P, 1900). In this sense, Soviet research work on construction history (Ivanov, 1962, et al.) and the development of construction science (Zvorykin, 1981), paradoxical as it might seem, to a large degree completed the cycle of the interpretation of the history and social tasks of architectural and construction practice begun in the second half of the 19th century. As the theoretical works of a number of leading representatives of European architectural and engineering schools have demonstrated - including Klenze, Semper, Hübsch, Wiebeking et al. - they were all gravitating towards a comprehensive, "determinist" assessment of the tasks of construction science and practice and at the same time sought to place it in the service of the State (at that time, of an absolute monarchy).
- By carrying out academic research work and more precisely generalizing at different levels historical experience in the field of building technology, Soviet science also defined a rather broad *field for the practical application of the new discipline*. This field included the in-depth training of a professional group of engineer-constructors, the expansion of the basis for joint work by engineers and architects, an analysis of the possible effects of technology on the economic and social progress of (socialist) society.

- By generalizing at various levels historical experience in the field of building technology, Soviet science from the 1930s through the 1980s produced a vast body of *documentation on Russian and Soviet* as well as European construction history that has remained largely unutilized (see References). These works were the result of scholarly activities carried out over the course of many years by numerous "collectives" made up of the staff of State institutions - a situation that is unlikely to be repeated in the near future. An analysis and integration of Soviet publications on construction history in the current general European scientific and professional context can provide significant assistance in carrying out further scientific and practical work on the questions under consideration.
- The "history of construction history" in the Soviet Union and Russia essentially illustrates the phenomenon of the emergence, development and, in fact, disappearance (or perhaps depletion) of a new technical discipline. Situated on the boundary between technology and history, it in many ways reflected both the idealism of limitless faith in the possibilities of technical progress as well as the social idealism of the twentieth century. The pronounced dogmatism of the methodological principles used contributed to the distinct stagnation of construction history in the Soviet Union as a young discipline. Owing to the country's ideological isolation, they were far removed from the new didactical and methodological searches characteristic of Western European research in the period from the 1950s through the 1970s. Nevertheless, the "history of construction history" in the Soviet Union and Russia can be viewed as *an independent chapter in the history of European science* in recent time. The historical phenomenon of the "emergence and disappearance" of this discipline in a specific country can be useful in view of the obvious attempt being made - also at the Second International Congress on this topic - to define the role of building technology in the modern science and practice of construction.

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NOTE

The author requests that the neutral tone of this paper, which is not meant to provide any general assessment of the social and political situation in the Soviet Union during the period under consideration, not in any way be linked with nostalgia for Eastern European totalitarianism.

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has been supplemented with several Western European publications. The titles of the publications in Russian have been translated into English. The publications are listed in chronological order and the list is not intended to be exhaustive.

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