

REVIEW



Stepan Prokofievich Timoshenko and America

Isaac Elishakoff 

Department of Ocean and Mechanical Engineering, Florida Atlantic University, Boca Raton, FL 33431-0991

Correspondence

Isaac Elishakoff, Department of Ocean and Mechanical Engineering, Florida Atlantic University, Boca Raton, FL 33431-0991.
Email: elishako@fau.edu

In this essay, we describe relationship of S. P. Timoshenko (1878–1972), who is often identified as “the father of American engineering mechanics” with America, where he arrived in 1922 and stayed until 1964. His autobiography appeared in 1963 in Paris in the Russian language; Timoshenko former students and colleagues at Stanford University arranged its translation into English that appeared in 1968 when Timoshenko became 90 years old. The book provides a testimony of the complex relationship that he developed towards America and Americans. Drawing from various documents in addition to his autobiography, this essay discusses in some detail various facets of his relationship. The main goal of this paper is to show that along harsh criticisms towards United States in his autobiographical book, in various documents he expressed positive views about US.

KEYWORDS

autobiography, private letters, S.P. Timoshenko

1 | GENESIS OF THIS STUDY

By the end of the past century there were two excellent papers reviewing the theory that incorporates shear deformation and rotary inertia and uniformly known as the Timoshenko beam theory (by Han, Benaroya and Wei,^[43] Laura, Maurizi and Rossi^[66]—the former paper cited over 760 times since its publication) there was no comprehensive review of its history, developments, controversies associated with it, and implications on a simpler theory than the one that was exposed by Timoshenko^[100–102] taking into account rotary inertia and shear deformation. I must mention that Professor J.N. Reddy perhaps is the author of maximal number of papers devoted to refined theories of beams and plates; his paper (Reddy, 1984) is cited not less than 3,200 times by now.

About a dozen years ago, I started to write an extensive review, on and off, and once its first draft was ready, about six years later, I sent it to some researchers for their possible inputs. Professor James Simmonds made some interesting suggestion along with the very complimentary evaluation of the study. It took us about four years to accommodate all suggestions of Jim and others; finally, when we sent him the final version, prior to submitting it to the *Applied Mechanics Reviews*, I learned that Jim had passed away just couple of months earlier. By the way, his conjecture on the need of refining boundary conditions turned out to be not required for high-frequency vibrations.

Our paper^[34] got published about ten years after its inception; it received very positive inputs from colleagues all over the world. During writing I was struck by the fact that Timoshenko exposed this theory first in 1916 in the book on elasticity,^[100] in the Russian language, where he mentioned that the derivation was conducted together with Paul Ehrenfest (1880–1933). It appeared surprising that they did not submit the joint work to a journal—the matter Timoshenko was doing routinely before that as well as during years 1911–1920. Then Timoshenko published again this theory in the Croatian journal in 1920, in English language, and yet again in the English journal in 1921. The 1920 and 1921 publications constituted the same paper with only difference that in one he references Rayleigh and in the other not; in neither he was mentioning Ehrenfest; it ought to be mentioned that his collected papers book^[104] and autobiography^[107,108] do not list the paper published in the Croatian journal in 1920).

As I Remember

THE AUTOBIOGRAPHY OF STEPHEN P. TIMOSHENKO

Stephen P. Timoshenko
*Professor Emeritus of Engineering Mechanics
 Stanford University, Stanford, California*

TRANSLATED FROM THE RUSSIAN

BY ROBERT ADDIS

D. VAN NOSTRAND COMPANY, INC.
 Princeton, New Jersey Toronto London Melbourne

FIGURE 1 The title page of Timoshenko's autobiography, published in 1968

These facts led to my desire to learn about Timoshenko-the-person more, leading to reading (and then rereading, several times) his intriguing autobiography.

Some scientists from former Soviet Union who now are in West helped me get various additional documents available freely in Russian language. This led to this paper, in parallel to writing a book titled *Handbook on Timoshenko-Ehrenfest Beam and Uflyand-Mindlin Plate Theories* (2019).

Unfortunately, I was not interested in Timoshenko as the person before 2015. Only two persons surprised me, in this regard. In 1984, I met Professor Wilhelm Flügge (1904–1990) in Lyngby, Denmark and I asked him *inter alia* about Timoshenko beam theory. Once Warner Koiter told me some fact about Timoshenko, but this did not incite my interest then since I thought that Timoshenko was not the only one, most unfortunately, in the world, in that particular regard. I also recalled that one Technion professor many years' prior, Yohoshua Borishansky, told me something very interesting about him: that he was extremely handsome (Figure 2), and the tens and sometimes hundreds of girls would flock to his lectures (although they didn't belong to the course!) just to look at him lecture, while lectures by famous Nikolay Y. Zhukovsky (1847–1921)—one of the world's foremost aeronautical pioneer's, who – with Bolshevik leader Vladimir Lenin's approval, established TsAGI, the Central Aerohydrodynamic Institute in nearby Moscow—attracted merely six students. Incidentally, the attendance of lectures in Czarist Russia was not mandatory. In the same vain, Richard Weingardt^[124] writes: "Richard Soderberg, a young emerging leader of WEC [Westinghouse Engineering Corporation—I.E.] at a time recalled, "He [Timoshenko] was in his forties (Figure 3), had a striking appearance, wore a beard..."

Thus the present writer missed asking Professors Vladimir V. Bolotin (1926–2008), Warner T. Koiter (1914–1997), Raymond D. Mindlin (1906–1987), Bernard Budiansky (1925–1999), George Herrmann (1921–2007), Arie van der Neut (1907–1984), Josef Singer (1923–2009), Nicholas J. Hoff (1906–1997) and many others about Timoshenko-the -person; they are not alive now. I also met once, in 1971 the biographer of Timoshenko's, Professor Eduard I. Grigolyuk (1923–2005), but had no clue I might be interested in the subject of his book. Why now? Since I am writing a book on beam theory now, and this paper may shed some additional light on him as a person, citing his own words.

It appeared worthy to explore the facets of life of Timoshenko that did not find sufficient exposure in the literature. Probably authors followed the known dictum about a classic work: "A book which people praise and don't read." Addiction to searching for truth is another motivation of composing this article. Whereas in his autobiographical book Timoshenko criticizes United States, in other sources he does provide positive inputs. In order to balance his negative attitudes, it will serve the justice if his positive comments will be brought to light.



FIGURE 2 S.P. Timoshenko in young age (courtesy of S.P. Timoshenko Archive, Stanford University)



FIGURE 3 S.P. Timoshenko in later years

2 | TIMOSHENKO'S DESCRIPTION OF AMERICA AND AMERICANS

In the beginning of his first job in the US, Timoshenko pondered ([108], p. 234) looking at his supervisor: “The professor was tired and sweating like a horse under the heavy burden. I couldn't help thinking that if a native-born American, director of a laboratory, had to work like that, what fate awaited me, a poor outsider?” Here is a sample of Timoshenko's comments, all drawn

from his autobiographical book *As I Remember*^[108] (Figure 1) as translated from the first, Russian edition, titled *Remembrances* or *Memoirs*:^[107]

1. “At that time, of course, America seemed to us a land of wonder” (page 13);
2. “Later at universities in America, as professor, I encountered students who lacked proper mathematical training. I saw how this affected the level of teaching, which had to be lowered, adjusted downward to the students’ level of preparation. Insufficient mathematical training has undoubtedly exerted great influence on the attitude of students toward the science of engineering. The American student, in most cases, is not interested in deducing any kind of formula, or in the basic assumptions underlying such deduction. All he wants is the final result – a formula which he can apply mechanically, without thought, to solve practical problems” (page 26);
3. “Recalling now my experience on the railroad, I see that it played a large role in my engineering education. It’s a pity that such opportunities for practice do not exist in American schools, that most of the students are graduated without real acquaintance with work in their field” (page 45);
4. “On my travel through Europe I had occasionally inspected ancient churches, usually found in them more tourists than people saying prayers. Here it was the exact opposite. As soon as I stepped inside, I realized that I was in the wrong place. A most respectable gentleman came up to me, told me how pleased he was that I had decided to come to their church. I found this highly embarrassing...” (page 230);
5. “... I had heard tales from Kirpichev, who was in rapture about America.

Subsequently, in organizing the Kiev Polytechnic, he had ordered from there [USA] one of the machines for the mechanical-testing laboratory. I later had to cope with that machine. For crude factory work it may have been suitable, but as a precisely fact for scientific research it was a failure. We made little use of it” (page 231);

6. “I was amazed by the American’s drastic procedures. To provide the necessary point to support for the specimen to be tested he took in iron spike and, without the slightest hesitation, hammered it into a brilliantly polished window frame. The harsh treatment of laboratory premises and equipment so common in America would be unthinkable in a European laboratory” (page 234);
7. “A physics professor at a major American university spends his time not on science but toiling as a farmer” (page 235);
8. “No one in Philadelphia was interested in engineering literature” (page 235);
9. “After long hesitation I decided to stay in America. Whether I chose rightly or wrongly, I don’t know even now, after some forty years” (page 236);
10. “I definitely did not like America. Here no one was interested in science and engineering” (page 236). Note that later in the Borisov’s^[21] article this statement appeared as a title;
11. “After long hesitation I decided to stay in America. Whether I chose rightly or wrongly, I don’t know even now, after some forty years” (page 236);
12. “...in America I have done little that was new. Whether this is because I was so busy with practical work, or because I was already about forty-five and starting to get old, I don’t know” (page 237);
13. “By then I already knew that there were no good engineering schools in America” (page 237);
14. “The sight of Philadelphia depressed my wife. On the way from the station to our apartment she broke into tears just from looking at the city” (page 237);
15. “One such morning we witnessed a strange savage spectacle. Outside one building, a student dormitory, a pitched battle was in progress. People there were covered with blood, their clothing all torn. It seems that upper-class students were beating up the ones newly admitted to the university, called “freshmen”. It was explained to us that this takes place at the start of every school year. Then fracas did not always turn out happily... At Russian universities nothing of the kind occurred” (page 238);
16. “I later observed that Americans completely fail to understand that intellectual endeavor requires silence and a modicum of comfort. I saw that managers of large departments in the factory did not have private offices to work in, as is customary in Europe...” (page 243);
17. “We couldn’t help comparing the Ph.D. exams in America with those in Russia and we were amazed at how easy the American ones were” (page 247);

18. "I was once told, for example, that 40 percent of the high schools in California had no mathematics teachers at all!" (page 248);
19. "America's railroads had been built by people with virtually no formal engineering education" (page 251);
20. "The curriculum was certainly much skimpier than that in Russia, I was amazed at the complete divorce of strength-of-materials theory from experimental results" (page 253);
21. "American life does not favor the flowering of scientific talent but draws the capable away – into administration" (page 261);
22. "The professor's job vis-à-vis the students was to prepare them for...examination" (page 280);
23. "I discovered that the matter of the accuracy of calculators was totally unfamiliar to them" (page 283);
24. "Clearly, under the conditions the training received by American engineers was inferior to that given engineers in Europe" (page 283);
25. "Later I saw that the statues of professors in America is not rated as high as in Europe. Here a good physician or engineer never dreamt of becoming a professor, but preferred private practice" (page 286);
26. "Our life in Ann Arbor was rather monotonous" (page 287);
27. "We left Ann Arbor without regret in the nine years that we had been there we made no close friends" (page 327);
28. "In Chicago we had to wait for the noon train, and had time to look over the city. But there was nothing to see. The only pretty part was the small strip of waterfront along Lake Michigan. The Museum of Art, with its interesting picture gallery, was there but what an ugly building! And this is one of the richest cities of the world!" (page 333);
29. "Life in the summer in America's big cities is almost unbearable" (page 349);
30. "Americans seem to have no understanding of rest through peace and quiet. They would come for a short time, go swimming, race around in motorboats, make a lot of noise, and then leave. Unable to stand fit, we went home ahead of time" (page 351);
31. "I must say that the American Red Cross, which sometimes was able to help one find relatives on the other side of the front, gave me no assistance at all" (page 353);
32. "The war had revealed America's backwardness in engineering education and in research institutes competent to solve experimentally various kinds of engineering problems" (page 355);
33. "I later learned that some grand swindles were perpetrated with this money. On Saturdays the Americans would go over to Basel and with this military currency engage in illicit commerce" (page 359);
34. "The Americans books on this subject struck me as unsatisfactory. American writers taught one how to do a calculation, never explaining why the calculation led to the desired results" (page 348);
35. "The situation changed radically when the Americans moved in. He said that American soldiers went systematically to every house and took from the occupants all their jewelry. Of the robberies staged by American servicemen I heard also from one of my pupils who lived not far from Düsseldorf" (page 367);
36. "I would not help recalling American libraries, where the employees cannot read even the titles of the foreign books that they lend out" (page 406);
37. "In America the railroads had no engineers at all" (page 407).

Timoshenko ([108], p. 352) writes about his retirement: "During the 1943–44 school year I turned sixty-five. According to Stanford rules, I was supposed to retire. If I had been living in Czarist Russia, I would have gone into complete retirement after thirty-five years of service, in 1936, and would have been drawing a pension adequate for a life free from care. In America there was no such pension". Timoshenko's conditional statement with "if I had been living in Czarist Russia", reminds one a quip by Golda Meir (1898–1978): "If my grandmother had had wheels, she would be a bus". Czarist Russia ceased to exist even before Timoshenko left Russia for Yugoslavia and then for United States!

Had he stayed in Russia he would have probably shared the destiny of his sister Maria. Let us listen to Timoshenko ([108], p. 394) about her fate: "My sister and her husband, a mechanical engineer, both had jobs but, as persons of non-proletarian background, experienced a lot of trouble. At one time their apartment was taken away from them. My sister was living now all by herself. Her husband was long dead; her children, a son and daughter, had been taken away during the war to toil in Germany, and never came back. She no longer worked but received a tiny pension, sometimes gave private lessons, and led a half-starved existence". Natural question arises: "If America was so bad why did he try to bring his father to United States?" This is what he wrote to Vernadsky around 1930: "Our plans to get together in Prague, from all ends of the world, did not get realized. Red

tape of your authorities is spoiling everything. My father was promised a passport, and they postponed the matter so long that the deadlines passed, and we all, who came to Prague, are going away without meeting the father. He is now 82 years old and I absolutely do not understand why it was necessary to keep him there. It is clear: he does not represent any danger to Soviet state”.

There are numerous places in Timoshenko^[108] book where he could have stopped and exclaimed “Thank you, America!” but Timoshenko refrains from doing so. Timoshenko describes his brother's condition in Poland: “He still lived in a tiny flat, primitively furnished, with nothing better in prospect. But now I had some savings in America and decided to help him”. This is the place and the time Timoshenko could have expressed gratitude to America but he remained silent. Let us continue reading what Timoshenko has to say: “I offered to lend him the money to build a house...when I got back to America, I sent him the money. The new house immediately improved his situation of course...”

Second, such an occasion is taking place after the WWII. Timoshenko visits Germany and his daughter Anna who lived there. Timoshenko ([108], pages 369–370) recalls: “From Göttingen I went to see my daughter. She and her family still lived in the country not far from the little town of Hösster... However, the town was crammed with refugees, and finding a place to live was impossible. The only solution was for them to build their own house. With my daughter, I walked over to Hösster. We found the places where the city was selling building sites and selected one. I promised her financial aid...” Could not Timoshenko have paused at this point of his story and expressed profound gratitude to America? Because of his move to United States in 1922, he could now help his own daughter and her family, buying them a house in post-war Germany. America enabled him to have his own Marshall plan, as it were, helping his daughter and family - citizens of the defeated country—to rebuild their lives, especially that, as Timoshenko ([108], p. 334), “...ownership is a great thing. It teaches one much”.

Not all of the above means that occasionally Timoshenko does not see something positive in USA: “The success of a research department in an engineering enterprise depends largely on *how* the achieved scientific results are transmitted to the people directly engaged in production. Communication between scientists and engineers, according to my observations, is better in America than in Europe” (p. 252). In another place (p. 284), he remarks: “Policing” of the exam was done by the students themselves [in the U.S.A – I.E.]. Abuses such as copying or getting help from someone were rare. In America, the attitude of students toward this is very different from the attitude, let us say, in Russia. A Russian student would not tell on student sitting next to him who had copied. The American does. The technique of correction examination papers is marvelously developed in America” (p. 284).

S. P. Timoshenko could have thanked America for his freedoms, and the nearly infinite possibilities America opened to him. However, Timoshenko chose to refrain from expressing his gratitude to the USA even once in 430 pages long memoir. Knowing that the Cold War was going on, did S. P. Timoshenko refrain from thanking America, desiring to get a recognition in his former homeland? This nagging question perhaps will remain unsolved for the near future unless some new documents surface. I missed of pose this question to many scientists who might have shed more light on Timoshenko's mysterious non-appreciation of America.

Presumed criticisms can be read and interpreted in different ways. Is it possible that Timoshenko's criticisms were designed to improve America rather than express dissatisfaction? Indeed, as a proverb maintains only the true friend will tell you if your face is dirty. Sometimes one can come exactly with this conclusion. For example, Ewen M'Ewen (1963) interviewed Timoshenko; his first question was: “One of the things that we would like to have you talk about a little, if you will, is engineering education, in your book about Russian education^[106] you compared it with the American”. Timoshenko responded: “I don't know that I definitely compared them because that would be very unsatisfactory for the Americans”. Then he added: “I have been here 41 years, practically all the time connected with engineering education: it is gradually improving, but it is not exactly what I would like to have!”

How to explain Timoshenko's apparent ingratitude towards America? According to Marinova (2011), “from a psychological point of view, emigration to a foreign country is a stressful process which can have many traumatic aspects depending on personal, interpersonal and environmental factors. The immigrant must work through many necessary external and internal changes in order for successful adaption to occur... For an immigrant, familiar patterns of being and relating to others are dislocated. Significant interpersonal losses are usually involved; because separation from family members, relatives, and friendly has to be undertaken, in addition to the loss of one's culture and familiar milieu...A native culture typically provides a feeling of safety and connectedness to others. An immigrant loses this cultural space and usually finds himself or herself in an unknown territory and habits are different from their own. Because of the discrepancy between immigrants, familiar way of relating to others and the different expectations of the new culture, these immigrants experience anxiety, confusion and a sense of discontinuity that threatens their sense of identity...The initial reaction of a newcomer in a foreign environment has been described as a cultural shock... The complex problems that immigrants face can be described also as a multiple crisis—a crisis of overload and a crisis of

loss.” According to Martinova (2011, p.257), ...” an immigrant may remain stuck in a defensive stance expressed as a nostalgic recreation of the past which disturbs their adaption to a new culture...”

3 | TIMOSHENKO'S LETTER TO V. I. VERNADSKY

In his letter to Vladimir Ivanovich Vernadsky (1863–1945), dated March 14, 1925, Timoshenko writes: “Capitalists, on one hand, and workers, on the other, [in U.S.A. – I. E.] are getting due to their organization and due to rude methods, more than they deserve. Especially such is the fact that the lot of the workers is high. In America, it is clearly seen that increase of the material well-being of the worker is not accompanied by the increase of spiritual demands. Spiritually he is a savage, despite the fact that he has a car and lives in comfortable house. From their newspapers and full lack of interest to books it is seen how miserable the life of these people is”. Here some comments appear to be called for. Timoshenko surely does not recognize the possibility that his coworker might have some hobbies. What is wrong in playing a trumpet?! And if others dance once and enjoys his trumpet – is that wrong? And is it wrong to want a new car and work for it? Perhaps Timoshenko didn't drive at that time, and considered long walks more attractive.

The term savage was unfortunately used also in a letter to Vladimir Ivanovich Vernadsky: “I left Philadelphia and already few three-month works at Westinghouse. Due to construction of electric locomotives and big electric machines, number of new mechanics problems of strength are arising. I am so concerned with some problems that temporarily forget that I live in a savage country. My daughter refers her comrades in school as “well dressed savages”, and this, in my opinion, is correct. I work at Research Department. It seems there should be an intelligent public with scientific interests. My closest neighbor – a young engineer – during days he is in the lab, but at nights, he plays trumpet in some dancing establishment, in order to double his income and spend money on a new car. Surely, with such a life no scientific interests could exists... All with is done – is done by the foreigners” (Bakhmeteff Archive, Columbia University).

Here is an extract from yet another letter, available at Bakhmeteff archive:” This is a surprising country! People live here in material comfort and get along without newspapers, theater, good bookstore, without libraries!... After work more diligent people continue to work at home, they repair and paint by their own hands and very much like physical work. Less diligent ones waste fine on automobile stroll and movies. Nothing more! I do not think one can get used to this country. I always have a feeling that life here is not real, and people got together to make money and leave.” Moreover, he emphasizes: “I start to think that the democratic system does not at all helps to develop appreciation of science and art – for these, despotic regimes, I would say, are better. (You see, how little is left from the Russian radicalism, when meeting with the American reality)”.

4 | SWEEPING GENERALIZATIONS

Timoshenko [108, p.282] makes sweeping generalizations, based on a single case; he informs: “My office-mate became chummier and chummier. Sometimes he even gave me a lift in his car. He started showing an interest in my living arrangement. Learning that I was not very satisfied with my apartment, he explained that most professors owned their own homes, that buying a house was made easy by the banks, which gave large loans, so that a buyer needed to put down only a small amount, paying off the rest in monthly installments. To this, I rejoined that I not intended to incur debts, would abstain from buying a house from the time being. After that, his interest in my affairs instantly vanished. He lapsed into science, stopped giving me lifts in his car. Later it came out that at the very time of our nice conversations he was trying to sell his house. Finding that I was not a buyer, he had no further need in me. I often encountered this shopkeeper mentality in Americans, so I learned to attach no meaning to their kindnesses and attentions”.

This statement and generalization appear to be at least strange. Timoshenko does not tell us in which tone he dismissed the sound financial advice of his office-mate; if Timoshenko's negative response was angry, then his office-mate could have concluded that Timoshenko did not seek for any advice, hence “he lapsed into silence”. As far as attaching “no meaning to their (Americans’ – I. E.) kindnesses and attention” just several pages prior to this encounter, Timoshenko [108, pp. 279–280] tells us about himself: “Here I was, a foreigner (who spoke poor English), set up in a privileged position. I had classes only a small number of hours per week, and my salary was nearly double that of an ordinary professor”. Was not this a great kindness towards him?! Compare this how Paul Ehrenfest was treated in Czarist Russia, during his stay in St. Petersburg: He was able to teach only during two semesters out of 5 years 1907–1912, despite the fact that he passed the demanded exams, being the first such foreigner in 25 years prior to that.

In the foreword to the book *As I Remember*, Professors James M. Gere (1925–2008) and Donovan Harold Young (1904–1980) inform us: ([108], p. VI): “As former students and, later, professional colleagues of Timoshenko, we have appreciated the opportunity to arrange for the translation and publication of his life's story”. Was not this a great kindness exercised by Timoshenko's American former students and colleagues? Timoshenko had a chance to include acknowledgement and express thanks to Gere and Young if not to America whose citizen he became in 1927. Likewise, they mention: “We have had the full support of Professor Timoshenko during the translation, and he has carefully checked this edition”. However, in 5 years that passed from the original Russian version of the book^[107] author could have revisited some of his statements and even changed them. However, Timoshenko apparently was determined to articulate that he did not appreciate neither America nor Americans. James Gere and Donovan Young give the hint to this fact in the foreword of Timoshenko's ([108], p. V) book: “His life in Russia before and during the Communist Revolution, his arrival in this country, and his adaptation (or failure to adapt!) to the American way of life are chronicled in his autobiography!”

5 | CRITICISM OF S. P. TIMOSHENKO AUTOBIOGRAPHY BY C. R. SÖDERBERG

Soderberg (1982) relates to the topic of Timoshenko's relationship to America: “Only gradually did we come to appreciate the turmoil and anxiety that had been his lot during the preceding years, Under the charming exterior there was a deep-seated disappointment in American culture, which to Timoshenko and his wife seemed crude and uncouth in comparison with their experiences in the Ukrainian countryside and in the cultural circles of Europe. He was still smarting under the effects of the cataclysm of his homeland, which prevented from reunion with his aged father. Out to these experiences grew a strange love-hate relationship in his feelings toward America. In reading *As I remember* one is astonished at the absence of a single word in grateful recognition of his debt to America, which had awarded him such a rare opportunity”.

Soderberg (1982) stresses: “It is a remarkable fact that, after nearly fifty years in the United States, he felt it necessary to write this book (his autobiography – I.E.) in Russian”.

6 | COMMENT ON S. P. TIMOSHENKO AUTOBIOGRAPHY BY C. T. HERAKOVICH

In his recent definitive book Herakovich^[45] comments: “On page 317 of his autobiography, Timoshenko make the statement: “In the 40 add years of my wonderings I have visited and lived in many countries, but only in Yugoslavia I never felt foreign. The 2 years that I lived there [Zagreb] appear to me now as the happiest of my life”. A most interesting statement in view of all the success he had while in the United States”.

It is instructive to check what does Timoshenko ([108], p. 200) report about his stay in Zagreb: “Having finished what I was writing, I took leave of my acquaintances and at the end of April [of 1920 – I. E.] left for Zagreb. Immediately I had trouble there about finding a place to stay. A special housing department of the city government was in charge of all the rooms in the hotels. New arrivals went straight from the station to that department, and there were assigned rooms. The rooms were assigned for only three days. After which one had to go back to the housing office and get reassigned. After switching hotels three times in one week, I was definitely tired of all this moving around and decided to appeal to the rector [Provost of the Zagreb Polytechnic Institute – I. E.] for help. Aware of the housing difficulties in Zagreb, he let me lodge temporarily in the private office set aside for me. It was a nicely furnished room with a sofa couch. Naturally I took advantage of his offer”.

Later on, on pages 214 and 215 of his autobiography, Timoshenko informs readers that when his family arrived to Zagreb, “The problem of lodgings somehow had to be solved. Aware of my difficult situation, the rector suggested, as a temporary arrangement that we move into the rooms intended as my future laboratory. I decided to take his suggestion... Sleeping arrangements were more of a problem, especially the first nights. Soon various improvements were made. For mother and father a bed was purchased, while the children slept on stools. Ten stools, tied together with rope, made me bed. In place of mattresses, racks filled with hay were used. And that is the way our children lived throughout our two-year stay in Zagreb”.

This surreal situation of his kids sleeping on chairs was accompanied with other problems (Timoshenko, p.225): “Zagreb was a fine city with a good climate. However, there were major drawbacks too. I was still living in makeshift quarters, with no hope of soon having my own apartment. My pay was enough to buy food with, but not for buying clothing or furniture”.

Compare this description of Timoshenko's life in Zagreb, with his beautiful house in Palo Alto, California, portrayed on page 330 of Timoshenko's autobiography! Therefore, Timoshenko's ([108], p. 317) description of two years that he lived in Zagreb as

“the happiest” of his life appear to be shocking, despite the reported harsh facts of his own life in Zagreb. The partial justification for Timoshenko's statement on page 317 could be that Croatian language, as a Slavic one, possibly was easier for him to lecture on, than English, which he describes several times as being “poor”! One of the Timoshenko medalists quotes him as asking frequently “What this is?” as a direct, word-by-word translation from the Russian.

7 | E. I. GRIGOLUYK'S TESTIMONY

Grigolyuk ([54], p. 60) writes: “Despite anything America did, it did not conduct essential changes in S. P. Timoshenko's personality. Thus, after forty years of life in America he continued to remark: “By them, the Americans, and by us, the Russians”. Apparently, this constituted the cross that Timoshenko had to carry to the end of his life. In 20s and 30s, when he was relatively young, he did not undertake efforts to return to homeland, probably due to the fact that the company [of friends – I. E.] that surrounded him, supported his previous decision.”

Grigolyuk ([54], p. 60) adds that he “not once in 60s I discussed with him the possibility of his return to Russia. But the question was answered by him unequivocally that he was now over 80, he felt that giving what he would want to contribute [to Russia - I.E.], he already could not, and his return to homeland he was associating with the need of concrete usefulness.”

8 | CRITICISM OF TIMOSHENKO AUTOBIOGRAPHY BY J. HARVEY

James Harvey (1969) – then graduate student in communication at Stanford – published his impressions of Timoshenko's^[108] autobiography in *The Stanford Daily* in 1969, a year after book's publication. This is what this keen reader of Timoshenko's book had to say: “Professor Timoshenko, a true member of the “old school” of life, loves the intellectual, refined life. He is superficially dispassionate in that he bases his human value system on how people deal with one another – especially “foreigners” – in their day-to-day dealings with each other; he attaches no significance to the outward “attentions and kindness” in which they occasionally indulge. Timoshenko's dislike for the ostentatious leads him to tell his story through relating hundreds of incidents, involving hundreds of people that have composed the mosaic of his life. In considering human hypocrisy, Timoshenko is especially wary of the “shopkeeper mentality” he encountered in America, which dictates being obsequious forwards others. His personal experiences revealed an “underlying harshness” of French people and an “aloofness” of the English that he also dislikes. Strangely, aside from his fellow Russians, only in the disciplined, businesslike Germans does Timoshenko find the fundamental humanity and love of other people he himself feels. His respect and affection for the German people in related through encounters with German scholars, military officers, and even a dedicated librarian who was “willing to take the time to help a curious outsider”. He tells of incidents in Germany when he was a student: “A completely unknown young man”, he writes, “was able, with no formalities whatever, to drop by the reception room of the most outstanding German scholars and here receive a friendly welcome and offers to show him around the laboratories and acquaint him with the principle scientific work going in them”. A few years before the Bolshevik take-over of Russian, the German army occupied Kiev, where Timoshenko was then living. The city had been filthy, economically stagnant, and clogged with deserters from the Russian army for month – all of which suddenly ended with the arrival of the highly – organized German troops. “A great thing is discipline”, he exclaims in recollection. ... His decision to stay in America after spending a “trial summer” here in 1922 was based on material considerations and put him at odds with much of what he valued in the established refinements of European society. Of this tortuous decision he merely reflects, “Whether I chose rightly or wrongly, I don't know even now, after some forty years” ... His dissatisfaction with the “strikingly coarse and ill-mannered” students at the University of Michigan after teaching here nearly a decade” ...

9 | COMMENT OF CHIA-SHUN YIH

In 1972, Dr. Chia-Shun Yih (1918–1997), Timoshenko Distinguished Professor, University of Michigan, wrote a piece “A Portrait in a Miniature” devoted to S. P. Timoshenko. This piece is mentioned in the Soderberg's essay written on behalf of the US Academy of Sciences. Yih (1972) writes about Timoshenko, *inter alia*, “His dislike of America, with its society structured in a different way, had its explanation here. The strong character and inflexible set of values he held sustained him and his work; in regard of America, of which his judgments were severe, they also blinded his vision. To live and work for 42 years in a country, to have tremendous influence there through his work, to be honored these till summer had o'erbrimmed the honeyed cells, and

not to feel an attachment to it: What would one call it, in point of sentiment? A failure or misfortune? The golden sunset that was his would have had as much warmth as brilliance if he had been able to find joy and solace from the beauty of the wilderness of America, to hold dear the native generosity, kindness, enthusiasm of its inhabitants (as he held the kindness of Germans), and thus to have a feeling of home during those long years”.

10 | TIMOSHENKO AS A PRODUCT OF BOTH THE RUSSIAN AND WESTERN EDUCATIONAL SYSTEMS

Timoshenko ([108], p. 244) ponders about his success in the USA: “Now some forty years later, thinking back over the reason for our achievements, I come to the conclusion that not a small role was played by the education that we had received at Russian engineering colleges. The thoroughness of our training in mathematics and the basic engineering subjects gave us an enormous advantage over Americans, especially in the solving of nonstereotyped problems.”

On the issue of education in Russia Hargittai^[44] writes: Theodore von Kármán “praised the level of training in the Russian engineering schools, which he thought, “was fairly high even by the best European standards.” Noteworthy is his praise for secondary school training (his father's specialty) in mathematics and science. He thought “the Russians were beginning to turn and research engineers, grounded in the fundamental sciences. This was near my heart since it was the message I had learned from Felix Klein in Göttingen, and which I hoped I had brought to America”. Timoshenko graduated from the Institute of Ways of Communication, one of the top Russian Universities. Still, he cannot be considered as a product solely of the Russian educational system with illustrious teachers as Kirpichev, Meshchersky, Bubnov and Krylov.

Russian educational system was greatly influenced by many foreigners. Most outstanding of these was Leonhard Euler (1707–1783) who spent 31 years in St. Petersburg, specifically years

1727–1741 and 1766–1783. According to Timoshenko ([108], p. 35), “strength of materials and the statics of structures were taught at one time at the Institute [of Ways of Communication in St.

Petersburg – I.E.] by the celebrated French engineers, Gabriel Lamé (1795–1870) and Benoît Paul Émile Clapeyron (1799–1864), who had started the laboratory for testing the strength of materials, and who had taken part in the building of Petersburg's chain bridges and the cupola of St. Isaac's Cathedral.” In his autobiography, Timoshenko ([108], p. 408) writes: “During the first third of the nineteenth century many of the professors, at the Institute had been French. The famous Lamé and

Clapeyron had begun their scientific careers here...” After foreign influences on the Russian education Timoshenko ([108], p. 336) writes: “When I began my studies at the Ways-of-Communication Institute, the influence of the French school was still noticeable in some of the textbooks. By the time I had finished, German influence had become predominant”.

Timoshenko was a fine product of the blend of Russian and European educational systems, studying books by A. Föppl, A.E.H. Love, B. Riemann. Timoshenko studied under Föppl, recalling ([108], p. 88): “From Föppl, too, I met with a friendly welcome. He let me attend his lectures and classes, permitted me detailed acquaintanceship with the work in the laboratory, the scientific projects, the machines and instruments being used there. For me all of it was extremely interesting. You see, this was the most renowned laboratory, organized by Bauschinger himself... Here in Munich I understood for the first time what it means to conduct a scientific operation in a laboratory”. Furthermore, Timoshenko ([108], p. 89) notes: “The different strength theories were to me a real novelty. Not one of our professors [in Russia – I.E.] had brought this subject to my attention, though by then there already existed a large literature on the subject, not only covering earlier writings of Coulomb, Mariotte, and Poncelet, but also the more recent writings of Duhem, Mohr, Guest, and Huber. I then read everything I could find on the question in Föppl's laboratory library, resolving that, when I returned home, I would describe all of these works...” This is how Timoshenko ([108], p. 90) summarizes his stay in Munich: “I learned a great deal from Föppl during my six-week stay in Munich, and I realized that work in a laboratory profits students only when directed by an experiment teacher who, during the experiment, continuously explains what is happening, calling their attention to the different aspects of the phenomenon. The laboratory must teach the student how to observe...”

Trips to Germany during summer months were not S. P. Timoshenko's novelty. It was perhaps introduced by Evgenyi L. Nicolai (1880–1950), who served as professor of Theoretical Mechanics at various Universities of St. Petersburg. His biographer Prokopov ([84], p. 521) writes, referring to the Czarist period: “Nicolai traveled, during the summer months of 1903 and 1905 to Germany, where, at the University of Göttingen he attended lectures in mathematics and mechanics given by known scientists Klein, Hilbert, Voigt” ([84], p. 521). Timoshenko might have borrowed Nicolai's idea of enrichment of his education at Göttingen.

Timoshenko ([108], p. 94, 95) pays tribute to Lord Rayleigh: “I attended lectures on Bubnov's elasticity theory, began reading Lord Rayleigh's book *The Theory of Sound*. That book made a great impression on me. I was particularly captivated by the

approximate method of calculating vibration frequencies of complex systems. At that time, I was interested in Frahm's work on torsional vibrations. He considered the case of a shaft of constant diameter with a mass at each end. Using Rayleigh's method, I showed that the influence of the mass of the shaft on the vibration period can be readily allowed for... In the future I was often to employ Rayleigh's methods. This book exerted a great influence on my subsequent scientific work". He again underscores influence of German universities upon him ([108], pp. 95–100) recollects: "Since it was difficult to work quietly in Petersburg, and the Polytechnic Institute was closed, I decided to use the time for studying at one of the German universities. There had accidentally come to my attention a note concerning L. Prandtl's work on the stability of beams... so I made up my mind to do some work under Prandtl at the University of Göttingen. In Göttingen at this time, the ideas of F. Klein had definitely triumphed... Klein's basic idea was to forge a closer link between mathematics and its applications... At the start of classes I signed up for Abraham's lectures on partial differential equations, W. Voigt's lectures on problems in mechanics, and for laboratory work on strength of materials under Prandtl... I decided not to take too many lecture hours, my main job being the work under Prandtl on my dissertation... I requested theoretical work, and Prandtl proposed that I continue his own dissertation... By the end of the semester I already had a whole series of results that I could show to Prandtl... He approved my results, and later, after many years, told me that I had been a good student..."

In his 1994 Timoshenko Medal Acceptance Speech, Prof. James R. Rice notes that Timoshenko "...had been lecturing to students on the history of concepts and ideas in solid mechanics, and on careers of those from Galileo to his own mentor, Ludwig Prandtl at Göttingen..." Likewise, Richard M. Christensen^[28] stressed: "Timoshenko wrote his dissertation under the great Prandtl, in Germany. Prandtl was famous because not only did he develop boundary layer theory for fluid mechanics, he also was a highly recognized contributor to solid mechanics."

One clearly sees from Timoshenko's own accounts that he could not have been solely the product of the Russian educational system, doing his dissertation essentially under Ludwig Prandtl (1875–1953)! He also was a student of Rayleigh (1842–1919) although did not take his course, this book exerting upon him, in his own words, "a great influence on... subsequent scientific work!" Timoshenko ([108], p. 83) also decided, "to tackle the most thorough course in this field, the book by A.E. H. Love (1863–1940) ..." Above considerations are compatible with statements made by Louis Pasteur (1822–1895): "Science knows no country because knowledge belongs to humanity" and Fyodor Dostoevsky (1821–1881): "There is no such thing as a national science".

11 | EFFECT OF FREEDOM OF TRAVEL

Anatoly Petrovich Filin (1993, p. 30) emphasizes the effect of Timoshenko's trips to Europe in years 1906–1914: "Thus, towards his 35th birth anniversary S.P. Timoshenko, being still a very young scientist with twelve-year experience after graduating from the university, had a chance to visit England, Germany (5 times), Italy (3 times), Finland, France (2 times) and Switzerland (6 times). Thus he had 18 visits of countries where he had contacts with series of outstanding scientists: F. Klein, T. Levi-Civita, H. Lamb, A. Love, L. Prandtl, J.W. Strutt (Rayleigh), A. Föppl, W. Voigt. He spent time abroad not as a tourist, but of considerable length. He attended lectures, worked in laboratories, conducted dissertation work, participated in seminars, and of the Congress. Towards his 35th birthday, Stephan Prokofievich was the author of 35 scientific works, amongst them courses of theory of elasticity, strength of materials and of known work in stability of elastic systems. The question is raised whether towards his 35th birth even very able and hardworking person could have achieved such results, were he to live in the conditions of rigid isolation from the outside world with its universities, laboratories, scientists? This factor of exposure to outside world was helpful to the establishment of the S.P. Timoshenko phenomenon also while he lived in the U.S.A. He was not prevented from the contacts with outside world. Indeed, Stephen Prokofievich Timoshenko was many times abroad, starting from 1920. There he was meeting with established scientists, participated in many congresses, schools, conferences and so on. Here is a simple list of these trips: 1921 – Britain (Scotland, Edinburgh), 1924 – Canada (Toronto); 1926 – Europe (several countries); 1928 – Europe (several countries); 1930 – England (London), France (Paris), Switzerland (many cities), Germany (Berlin), Denmark (Copenhagen), Sweden (Stockholm); 1932 – Switzerland (several places), France (Paris, Avignone, Riviera, Grenoble), Italy (Rome); 1934 – Egypt, Greece, Poland (Lutsik); Italy, Palestine, Yugoslavia, Germany; 1937 – Germany (Berlin, Göttingen), France (Paris), Poland (Lutsik); 1939 – Switzerland (Zurich); 1947 – England (London), Switzerland (Zurich); 1948 – England (London), Switzerland, France, Germany, Italy, Turkey (Istanbul); 1953 – Italy, Switzerland; 1955 – Switzerland; 1956 – Belgium (Brussel); 1958 – USSR (Kiev, Kharkov, Moscow, Leningrad), Finland, Switzerland; 1960 – Italy (Stresa, Turin); 1964 – Germany (Munich); 1967 – USSR (Kiev, Romny, Moscow, Leningrad). Surely, from the moment when Stepan Prokofievich became recognized authority on the world scale, many of his trips in Europe, America, Asia and Africa became not the factors that increased his authority, but its consequence. Still, undoubtedly, while he was continuing his visits and active contacts with

academic centers of many countries, meeting and conversing with scientists he was increasing his scientific potential. Thus, one of the factors of establishment of the S.P. Timoshenko phenomenon was the fact that during all his life he was in conditions of full accessibility of outside scientific world... It is necessary to emphasize one additional factor that secured the establishment of the S.P. Timoshenko phenomenon. I have in mind the level of material remuneration of the scientist, allowing him, while he had the freedom of movement around the world, to utilize this freedom. Timoshenko was lucked out in this respect – he was sufficiently well paid person, and had a possibility of conducting long scientific trips.”

S.P. Timoshenko could have thanked America for this freedom, and the possibilities America opened to him! However, Timoshenko chose to refrain from expressing his gratitude to the USA even once in his 430 pages long memoir! Was this a deliberate act? Did he remain a leftist that he was in his youth? Abram F. Ioffe (1880–1960) opposes this view in his memoir:^[56] Knowing that the Cold War was going on; did S.P. Timoshenko refrain from thanking America, desiring to get a recognition in his former homeland? This question perhaps will remain unanswered. I missed to pose this question to numerous researchers who knew

Timoshenko well, and who might have shed more light on Timoshenko's mysterious in-appreciation of America. What did he say when the ASME awarded him the first S.P. Timoshenko Medal? Did he thank the country, which bestowed such a great honor upon him? Many S.P. Timoshenko Medal Acceptance speeches are recorded on the site iMechanica - web of mechanics, and mechanicians, but not the initial recipients of the Timoshenko medal. I was likewise unable to obtain S.P. Timoshenko's acceptance speech from the Timoshenko Archive at Stanford University.

12 | POSITIVE COMMENTS ABOUT UNITED STATES

The natural question arises if Timoshenko had anything positive to say about the country where he lived 42 years. Vladimir Raizer^[85] informs that Timoshenko while visiting Moscow in 1958 paid a visit to ZNIISK (Central Scientific Investigative Institute of Civil Engineering), meeting Aleksei R. Rzhantsyn (1911–1987) and Boris G. Korenev (1910–1998). “When told that Moscow is continuously flourishing, he responded that he does not see any advantages in this matter, and that in United States—under the market economy—the cities get wonderfully taken care of”.

In his letter, sent from Philadelphia and addressed to Vladimir I. Vernadsky (1863–1945)—Ukrainian and Soviet mineralogist, who was a founder of the Ukrainian Academy of Sciences, on July 15, 1922, Timoshenko wrote: “Dear Vladimir Ivanovich: ... You write that the scientific work is continuing (in USSR – I.E.). However, I cannot imagine that it goes successfully, when people are dying due to hunger and live in unheated premises. **As far as I'm concerned, I am every day blessing my destiny and luck** (emphasis mine—I.E.). I succeeded to leave myself and bring out my family... I am living in Philadelphia for three weeks, serving in “Vibration Speciality C”, where I deal with use of my knowledge in mechanics and theory of elasticity to solving practical problems, mainly connected with building the military navy... People that I meet here I live very much. There is no narrow “nationalism”, with which you always meet in Europe and especially is unpleasant to me in small Slavic countries as Yugoslavia and Czechoslovakia. In Yugoslavia they even changed the word “University” into Svenciliste” (see Bakhmeteff Archive, G. Vernadsky Collection, B.85, F. 1922).

Yet in another letter to Vernadsky, Timoshenko writes: “Philadelphia, December 22, 1922: Dear Vladimir Ivanovich: ...It would be so good if you would fulfill your assumption on **resettlement to America!** (Emphasis mine—I.E.). If in universities you have private acquaintances, situation may change. It seems to me that in no other country the personal connections play such a huge role, as here. For time being I am glad with my work, but do not leave the idea of returning to pedagogical work, is far as I become stronger with the language and will learn local customs will start to deal with professorship. Now I often get letters from Russia – much too dark news – I become strengthened in my thought that I would not be returning home. All is destroyed, and the remnants of science totally are incompatible with current Russian life and will disappear slowly”.

The third letter reads as follows: “Philadelphia, March 7, 1923: Dear Vladimir Ivanovich: ...I couldn't penetrate into local academic medium, and this is not easy either, especially if one takes into account that I'm not very strong in language...As far as the conditions of life are concerned in Philadelphia – I can inform you the following: I live here with my wife and kids.

Food per week costs between 15 and 20 dollars. The same amount is needed for apartment rental. For most humble living one needs 3,000 dollars per year. In order to purchase books and rest in summer, one needs to have a pay not less than 4,000 dollars annually. **We all are prospering here** (Emphasis mine—I.E.). American climate is not bad. Don't you know some professors at Harvard? I think on finding there some scientific work. Can you recommend me to someone from Carnegie Institution? I think this establishment could help me in publishing book in English”.

It was pleasing to find Timoshenko's positive quote about USA in *The Stanford Daily* (Figure 4). Ames (1939) reports on his interview: “Oh, yes, it was very hard to get out of a country, he chatted on gutturally. “Our chance came during the Polish

The Stanford Daily

Breaking news from the Farm since 1892

The Stanford Daily > The Stanford Daily, 28 November 1939

The Stanford Daily, Volume 96, Issue 46, 28 November 1939

Timoshenko, Soviet Fugitive, Denounces Russian Tyranny

By BUD AMES

"No, I don't like Stalin, and I don't like his regime. And I don't know anybody who does like him. Nobody can like a regime where they have to string up barbed-wire to keep citizens from running out of the country."

Thus boomed the heavily accented voice of Stephen P. Timoshenko, professor of theoretical and applied mechanics, fugitive from Russia, and

at present a member of the Farm faculty.

He was born in 1878, 61 years ago, in the town of Kiev. That's in South Russia about 700 miles from Moscow. His interest as a boy was in the mechanical and structural, so it was natural that he enter the advanced engineering school at Petersburg. He became a professor of engineering in the same city.

REVOLUTION CAME

And then came the revolution. With the Communists came danger for persons in the intellectual professions, so Mr. Timoshenko and his wife, who comes from South Russia too, fled across the border to Warsaw, the former capital of former Poland.

"Oh, yes, it was very hard to get out of the country," he chatted on gutturally. "Our chance came during the Polish intervention in 1920. We fled, but since the Polish army was soon in retreat, it took us two weeks to travel 400 miles to cross the border."

The next two years, until 1922, the polite professor taught at Zagreb, the capital of Yugoslavia. Then he moved to the United States. In 1936 he joined the Stanford faculty.

LIKES AMERICA

"Oh, yes, I like America," he said, pondering. "But I miss Russia. But I never can go back—at least not under the present regime."

During the war? Well, he served in the Russian Navy as a consulting engineer and later as a member of the important Engineering Council of the Russian Army. This work was all out of uniform, and was concerned with military inventions.

As to Russia's present squabblings with Finland, Mr. Timoshenko feels that his native land may go into a small war, with Finland, for example. But he doesn't feel that Russia is established well enough to start a "big war."

FIGURE 4 The interview of Timoshenko in Stanford's student newspaper *The Stanford Daily* (courtesy of *The Stanford Daily*)

intervention in 1920. We fled, but since the Polish army was soon in retreat, it took us two weeks to travel 400 miles to cross the border" Ames (1939) continues to quote Timoshenko: "Oh, yes, I like America", he said, pondering. "But I miss Russia. But I never can go back—at least not under the present regime."

Eventually, he did travel to Russia, in 1958 and 1967 after Josef Stalin's (1879–1953) demise, about whom he was quoted as have said the following: "No, I don't like Stalin, and I don't know anybody who does like him. Nobody can like a regime where they have to string up barbed-wire to keep citizens from running out of the country".

Bailes^[7] points out that Vernadsky "...was to remain to the end of his life a strong advocate of close scientific ties with other countries, traveling abroad almost every summer in order to stay current with Western developments, until he was forbidden to do so by Soviet government in the mid-1930s." References of Aebbers and Reid (1987), Allilueva (1967), Ames (1939), Bailes (1978, 1981), Baker (2016, 2017), Barenblatt (2016), Batchelor (1993), Beyer Robert (1999), Bažant (2009), Behrends (2016), Bers (1988), Biot (1989), Bodenschatz and Eckert (2011), Borisov (1993, 1997, 2001), Case (1925, 1957), Chebotarev and Ingersoll (2003), Crandall (1995), Davies Manvice (1947), Dryden (1965), Duda (2006), Elishakoff (2018, 2019), Elishakoff and Lubliner (1985), Fermi (1971), Filin (2007), Flügge (1960, 1967), Griffen (2004), Halary (1965), Hetnarski and Ignaczak (2011), Heyman (1968, 2003), Howard (2017), Gere et al. (2016), Goldstein (2013, 1966), Gorn (1992), Grigolyuk (2003), Johnson and Kolmogorov (2002), Kaplunov (2016), Karevin (2016) Kienzler (2000), Kienzler, Altenbach and Ott (2013), Kuskun (2003), Kirillov et al. (2016), Kr (2002), Lighthill (1952), Loewner (1988), Lurie (1955, 1947), Muskhelishvili (1952, 1966), Nadai (1931, 1950), Novozhilov (1953), Marble (1995), Martinova (2011), Medawar and Pyke (2001), Nitoburg (2005), Pisarenko (1991), Prandtl (1952, 1948), Reitman (1997), Rogachevsky (2017), Sadovnichii (2002), Saint Venant (1984), Sears (1991), Shanley (1957), Simha (2002), Shibanov (2015), Solzhenitsyn (1978), Sorokina (2001), Sreenivasan (2017), Tcherapukhin (2016), Timoshenko (1922, 1953), Timoshenko and Young (1935), Todhunter and Pierson (1886), Truesdell (1953, 1968, 1984), Truesdell and Noll (1965), Vogel-Prandtl (2014), Vernadsky (1964), Vincenti (2017), Vlasov (1961), von Kármán (1927, 1961, 1935), Weiner (2016), Wyman (1968), Schneider and Kienzler (2015), Sommerfeld (1949), Kneser and Klein (1948), von Kármán et al. (1960), Zierrep and Prandtl (2000), Zhu (2007) are discussed in detail in the forthcoming book by Elishakoff (2019) tentatively titled "Stepan Prokofievich Timoshenko at 140: Going Strong." It was felt that it was instructive to list above references so the interested reader can consult with them.

13 | CONCLUSION

In their biographical memoir about S. P. Timoshenko, as Fellow of the Royal Society, Mansfield and Young (1973) stress, *inter alia*: "Perhaps the least understood characteristics throughout his years in America was a refusal to adapt to their way of life. In his more than forty years there, he wrought more change in America than Americans did as him. But, if he did not put down any roots there, he certainly sowed many seeds from which have grown wonderful plants that will bear rich fruit for years to come". This essay attempted to shed more light on this "least understood characteristic". Timoshenko didn't need to adapt to America; the minimum what one could anticipate was a feeling of gratitude to the country that adopted him.

According to Chen and El-Metwally:^[26] "It was during his years in the United States that Timoshenko made the major part of his contributions and writings to the theory of elasticity and to its application to the design of engineering structures and components". Chen and El-Metwally^[26] write: "Timoshenko, his colleagues, and his students became internationally known for their pioneering work in elasticity, especially those classical textbooks used widely in engineering practice and university teaching in particular." Timoshenko's unparalleled "12 textbooks (characterized by^[124] as having a "gold standard") are the best gifts he could have given to any university. These textbooks are the best testimony of the fact that Timoshenko's 'phenomenon' was made by Ukraine, Russia, Germany, Croatia, and especially the United States.

ACKNOWLEDGEMENTS

Author wants to express sincere gratitude to Professors Norman Abramson of Southwest Research Institute; Holm Altenbach of Otto-von-Guericke-University, Magdeburg; Igor Andrianov of RWTH Aachen; Zdenek P. Bažant of Northwestern University; Nachum P. Fleishman of Lvov University; Raphael T. Haftka of University of Florida; Harry Hilton of University of Illinois, Urbana-Champaign; Julius Kaplunov of Keele University; Vladimir D. Raizer of San Diego State University for discussing various topics associated with this essay. Author also records sincere appreciation to late Professors Warner T. Koiter of the Delft University of Technology, Wilhelm Flügge of Stanford University, and Yehoshua Borishansky of the Technion-Israel Institute of Technology, Israel for various discussions on the topic of this essay. Naturally, none of the above individuals bear any responsibility on the contents of this essay. I also am extremely indebted to Dr. Daniel Hartwig of Stanford University Library for providing permission of incorporating some images associated with S.P. Timoshenko.

ORCID

Isaac Elishakoff  <https://orcid.org/0000-0002-1723-7771>

REFERENCES

- [1] D. J. Aebbers, C. Reid, An Interview with Lipman Bers, *The College Mathematics Journal* **1987**, 18, 274.
- [2] S. Allilueva, *Twenty Letters to a Friend*, Hutchinson of London, **1967**.
- [3] B. Ames, Timoshenko, Soviet Fugitive, Denounces Russian Tyranny, *The Stanford Daily* Nov. 28, **1939**, 96 (available at <http://stanforddailyarchive.com/cgi-bin/stanford?a=d&d=stanford19391128-01.2.12&e=——en-20-1-txt-txIN——>, retrieved on December 14, 2016).
- [4] Anonymous, Eight More ‘Engineering Heroes’ Celebrated by Stanford’s School of Engineering: Stanford School of Engineering Honors Eight Engineering Trailblazers whose Work Has Changed the World, *Stanford Report*, February 23, **2012**.
- [5] Anonymous, Referat, Stepan Timoshenko (Essay Stephen Timoshenko), available at <http://myreferat.net/referats/144/43623>, retrieved on 26 June **2017**.
- [6] K. E. Bailes, *Technology and Society Under Lenin and Stalin: Origins of the Soviet Technical Intelligence, 1917–1941*, Princeton University Press, Princeton, N.Y. **1978**.
- [7] K. E. Bailes, *Science and Russian Culture in the Age of Revolutions, V.I. Vernadsky and His Scientific School, 1863–1945*, Indiana University Press, Bloomington, IN. **1990**.
- [8] K. E. Bailes, Science, Philosophy and Politics in Soviet History: The Case of Vladimir Vernadskii, *The Russian Review* **1981**, 40, 278. (available at www.jstor.org/stable/129376?seq:1#page_scan_tab_contents, retrieved on November 29, 2016).
- [9] D. L. Baker, Charles Loewner: Louisville’s Misplaced Scholar, available at ccresident.org/Authors/PaulLoewner/CharlesLoewner.pdf, accessed on January 17, 2017).
- [10] K. Baker, *America the Ingenious: How a Nation of Dreamers, Immigrants and Thinkers Changed the World*, Artisan, New York **2016**.
- [11] G. I. Barenblatt, Applied Mechanics: An Age-Old Science Perpetually in Rebirth, Timoshenko Medal Acceptance Speech, available at the World Wide Web, <http://imechanica.org/node/198>, retrieved on Dec. 19, 2016.
- [12] G. K. Batchelor, Sealing Laws for Fully Developed Turbulent Shear Flows, *J. Fluid Mech.* **1993**, 248, 513.
- [13] T. Beyer Robert, *Sounds of Our Times: Two Hundred Years of Acoustics*, Springer, New York **1999**.
- [14] Z. P. Bažant, Reminiscences and Reflections of a Mechanician by Luck, Timoshenko Medal Acceptance Speech, (available at the World Wide Web <http://imechanica.org/node/7099>, retrieved on January 10, 2017), **2009**.
- [15] T. Behrends, The Renaissance of V.I. Vernadsky, *The Geochemical News, Newsletter of the Geochemical Society*, October 2005, available at www.gh125_art_behrends.pdf (retrieved on November 30, 2016).
- [16] L. Bers, *The Migration of European Mathematicians to America*, in *A Century of Mathematics in America* (Eds: P. Duren, R. A. Askcy, U. C. Merzbach), Vol. 1, American Mathematical Society, Providence, RI **1988**, pp. 231–243.
- [17] M. A. Biot, Timoshenko Medal Lecture: Science and the Engineer, *Appl. Mech. Rev.* **16**, 89.
- [18] E. Bodenschatz, M. Eckert, *Prandtl and the Göttingen School*, in *A Voyage Through Turbulence* (Eds: P. A. Davidson, Y. Kaneda, H. K. Moffatt, K. R. Sreenivasan), Cambridge University Press, Cambridge **2011**.
- [19] V. P. Borisov, *Russian Scientific Emigration of the First Wave*, Moscow **1993**.
- [20] V. P. Borisov, *Timoshenko Stepan Prokofievich*, in *Zolotaya Kniga Emigratsii (Golden Book of Emigration)*, Moscow, **1997** pp. 623–625 (in Russian).
- [21] V. P. Borisov, “I Definitely Did Not Like America”, *Priroda (Nature)*, Issue 4, **2000**, 57–66 (in Russian).
- [22] V. P. Borisov, *Stepan Prokofievich Timoshenko*, in *Rossiskaya Nauchnaya Emigratsiya: 20 Portretov (Russian Scientific Emigration: 20 Portraits)*, pp. 112–126, Moscow, **2001** (in Russian).
- [23] J. Case, *The Strength of Materials*, Edward Arnold, London **1925**.
- [24] J. Case, A. H. Chilver, *Strength of Materials*, Edward Arnold, London **1957**.
- [25] T. Chebotarev, J. S. Ingersoll (eds.), *Russian and East European Books and Manuscripts in the United States, Proceedings of a Conference in Honor of the Fiftieth Anniversary of the Bakhmeteff Archive of Russian and East European History and Culture*, London: Routledge, **2003**.
- [26] W.-F. Chen, S. E.-D.E. El-Metwally, *Understanding Structural Engineering: From Theory to Practice*, CRC Press, Boca Raton **2011**.
- [27] S. H. Crandall, *Jacob Pieter Den Hartog*, in *Biographical Memoirs*, Vol. 67, The National Academies Press, Washington D.C. **1995**, pp. 100–117.
- [28] R. Christensen, Timoshenko Medal Acceptance Speech (available at imechanica.org/node/15672, accessed on January 10, 2017), **2013**.
- [29] R. Davies Manvice, *Refugees in American Report of the Committee for the Study of Recent Immigration from Europe*, New York **1947**.
- [30] H. L. Dryden, *Theodore von Karman, A Biographical Memoir*, National Academy of Sciences, Washington, D.C. **1965**, pp. 1881–1963.
- [31] A. Duda, *Einführung des Herausgebers und Übersetzer (Introduction by the Editor and Translator)*, in *Erinnerungen: Eine Autobiographie, (Remembrances: An Autobiography)* (Ed: S. P. Timoshenko), Ernst und Sohn **2006**, pp. 10–19 (in German).
- [32] I. Elishakoff, J.P. Den Hartog about S.P. Timoshenko: Fifty Years Later, *Math. Mech. Solids* **2018**, 23, pp. 1–8.

- [33] I. Elishakoff, Handbook on *the Timoshenko-Ehrenfest Beam and Uflyand-Mindlin Plate Theories*, World Scientific in press, Singapore **2019**.
- [34] I. Elishakoff, J. Kaplunov, E. Nolde, Celebrating the Centenary of Timoshenko's Study of Effects of Shear Deformation and Rotary Inertia, *Appl. Mech. Rev.* **2015**, 67, article 060802.
- [35] I. Elishakoff, E. Lubliner, *Random Vibration of a Structure via Classical and Nonclassical Theories*, in *Probabilistic Methods in the Mechanics of Solids and Structures* (Eds: S. Eggwertz, N. C. Lind, eds.), Springer, Berlin **1985**, pp. 455–467.
- [36] L. Fermi, *Illustrious Immigrants; The Intellectual Migration from Europe 1930–41*, 2ns ed., Chicago **1971**.
- [37] A. P. Filin, *Essays on Scientists-Mechanicians*, “Strategija” Publishing House, Moscow **2007** (in Russian).
- [38] W. Flügge, *Viscoelasticity*, Springer, Berlin **1967**.
- [39] W. Flügge, *Tensor Analysis and Continuum Mechanics*, Springer, Berlin **1972**.
- [40] W. Flügge, *Stresses in Shells*, Springer, Berlin **1960**.
- [41] L. O. Griffen (ed.), *S.P. Timoshenko - Mechanician of the Twentieth Century*, Ukraine's national Technical University, Kiev Polytechnic Institute, Kiev **2004** (in Ukrainian).
- [42] D. S. Halary, *Father of Supersonic Flight: Theodore van Kármán*, Julian Messner, New York **1965**.
- [43] S. M. Han, H. Benaroya, T. Wei, Dynamics of Transversally Vibrating Beams Using Four Engineering Theories, *J. Sound Vib.* **1999**, 325, 935–988.
- [44] I. Hargittai, *Martians of Science: Five Physicists Who Changed the Twentieth Century*, Oxford University Press, **2006**.
- [45] C. T. Herakovich, *Mechanics IUTAM USNC/TAM: A History of People, Events, and Communities*, Springer International Publishing Switzerland, **2016**.
- [46] R. Hetnarski, J. Ignaczak, *The Mathematical Theory of Elasticity*, 2nd ed., CRC Press, Boca Raton **2011**.
- [47] J. Heyman, *Engineering Plasticity*, Cambridge University Press, Cambridge **1968**.
- [48] J. Heyman, *Truesdell and the History of the Theory of Structures*, in *Essays of the History of Mechanics in Memory of Clifford Ambrose Truesdell and Edoardo Benvenuto*, (Eds: A. Becci, M. Corradi, F. Foce, O. Pedemonte), Birkhäuser, Basel **2003**, pp. 9–19.
- [49] Y. N. Howard (ed.), *The Rayleigh Archives Dedication*, Office of Aerospace research, United States Air Force, AFRL Special Report No. 63, 1967 (available at www.dtic.mil/dtic/tr/fulltext/u2/655773.pdf, accessed on January 16, 2017).
- [50] J. M. Gere, G. Herrmann, W. M. Kays, E. H. Lee, Memorial Resolution, Stephen P. Timoshenko (1878–1972), available at wandering.userweb.mwn.de/Links/Biographien/TimoshenkoS.pdf (read on 22 October, 2016).
- [51] S. Goldstein, Biographical Memoir of Theodore von Karman, *Progress in Aerospace Sciences*, Vol. 59, 20–33, **2013**.
- [52] S. Goldstein, Theodore von Kármán 1881–1963, *Biographical Memoirs of Fellows of Royal Society* **1966**, 335–365.
- [53] M. H. Gorn, *The Universal Man: Theodore von Kármán's Life in America*, Smithsonian Institution's Press, Washington, DC **1992**.
- [54] E. I. Grigolyuk, *S. P. Timoshenko: Life and Destiny*, Moscow **2000** (in Russian).
- [55] E. I. Grigolyuk, Difficult Return. Academician S. P. Timoshenko and His Works in Soviet Union, *Nauka i Zisn (Science and Life)*, Issue 12, **2003** (in Russian).
- [56] A. F. Ioffe, *Vstrechi s Fizikami (Meetings with Physicists)*, “Fizmatlit” Publishing House, Moscow **1960** (in Russian).
- [57] W. Johnson. and V. L. Kolmogorov, Some Celebrated Contributors to the Strength and Processing of Materials, *Int. J. Mech. Sci.* **2002**, 44, 1033.
- [58] J. Kaplunov, Personal Communication, October 22, **2016**.
- [59] A. Karevin, [Timoshenko] Did Not Want to Be an Ukrainian, *Malorossiiskii Vetnik SankPeterburga*, 1 February, 2014 (in Russian) [available on World Wide Web, <http://ru.wikipedia.org/wiki/Timoshenko> (retrieved on 5 September, 2016).
- [60] R. Kienzler, *Plates and Shells*, in *Mechanics in Material Space*, Springer, Berlin **2000**, pp. 219–237.
- [61] R. Kienzler, H. Altenbach, I. Ott (eds.), *Theories of Plates and Shells: Critical Review and New Applications*, Springer, Berlin **2013**.
- [62] W. T. Koiter, Comment on “Timoshenko Beam Theory Is Not Always More Accurate Than Elementary Beam Theory, *Journal of Applied Mechanics* **1977**, 44, 357–358.
- [63] I. Kuskun, Book Review: “Russian Scientific Emigration. 20 Portraits,” *New Journal* **2003** (in Russian).
- [64] N. P. Kirillov, V. N. Fadeeva, V. V. Fadeev, Modern Philosophy of Education, *SHS Web of Conferences*, Vol. 28, article 01034, **2016**.
- [65] Y. Kr, Timoshenko and His Books, *Resonance*, p. 45, **2002**.
- [66] P. A. A. Laura, M. J. Maurizi and R. E. Rossi, A Survey of Studies Dealing With Timoshenko Beams, *The Shock and Vibration Digest* **1990**, 22, 3–10.
- [67] M. Y. Lighthill, *Essentials into Fluid Mechanics*, Hafner Publishing Co., New York, N.Y. **1952**.
- [68] C. Loewner (author), L. Bers (ed.), *Charles Loewner: Collected Papers*, Birkhauser, **1988**.
- [69] A. I. Lurie, *Three-Dimensional Problems of Theory of Elasticity*, “GITTL” Publishers, Moscow **1955** (in Russian)

- [70] A. I. Lurie, *Statics of Thin-Walled Elastic Shells*, “Gostekhizdat” Publishers, Moscow **1947** (in Russian) (English Translation: AEC-tr-3798, Atomic Energy Commission, 1959).
- [71] N. I. Muskhelishvili, *Some Basic Problems of the Mathematical theory of Elasticity*, Cambridge University Press, Cambridge **1966**.
- [72] A. L. Nadai, *Theory of Flow and Fracture of Solids*, McGraw-Hill, New York **1950**.
- [73] V. V. Novozhilov, *Foundations of the Nonlinear Theory of Elasticity*, Graylock Press, New York **1953**.
- [74] F. E. Marble, Interview by Shirley K. Cohen, Pasadena CA, January – March 1994, 21 April 1995 (Oral History Project, California Institute of Technology Archives, Retrieved 5/12/2015 from the World Wide Web: http://resolver.caltech.edu/CaltechOH:OH_Marble_F_, retrieved 26 June, 2017).
- [75] O. Martinova, Psychological Problems of Emigration and Exile, in *Scholars in Exile and Dictatorships of the 20th century*, (M. Stella, S. Strbanova and A. Kostlan, eds.), Prague: The Centre for the History of Sciences and Humanities, Institute for Contemporary History of the ASCR, 2011 (available at [Scholars_in_Exile_2011_Proceedings\(4\).pdf](#), read on November 12, 2016).
- [76] J. Medawar, D. Pyke, *Hitler's Gift: The True Story of the Scientists Expelled by the Nazi Germany*, Arcade Publishing, New York **2001**.
- [77] E. M'Ewen, Interview with Professor S. Timoshenko, *The Chartered Mechanical Engineer* **1963**, 10, 466–469.
- [78] N. I. Muskhelishvili, *Some Basic Problems of the Mathematical Theory of Elasticity*, Noordhoff, Groningen **1952**.
- [79] A. Nadai *Elasticity A Mechanics of the Plastic State of Matter*, McGraw-Hill, New York **1931**.
- [80] E. L. Nitoburg, *Russian in the USA: History and Fates: 1870–1970: Ethnohistoric Essay*, “Nauka” Publishing House, Moscow **2005**.
- [81] G. S. Pisarenko, *Stepan Prokofievich Timoshenko, 1878–1972*, “Nauka” Publishing House, Moscow **1991** (in Russian).
- [82] L. Prandtl, *Essentials of Fluid Dynamics: With Applications to Hydraulics, Aeronautics, Meteorology, and Other Subjects*, Hafner Pub. Co., New York **1952**.
- [83] L. Prandtl, Mein Weg zu Hydrodynamischen Theorien, *Physikalische Blätter* **1948**, 4, 89–92, (in German).
- [84] V. K. Prokopov, *Life and Work of Professor E. L. Nicolai*, in *Nicolai E. L., Works in Mechanics*, “GITTL” Publishing House, Moscow **1955**, pp. 515–579 (in Russian).
- [85] V. D. Raizer, Personal Communication, October 18, **2016**.
- [86] J. N. Reddy, A Simple Higher-Order Theory for Laminated Composite Plates, *Journal of Applied Mechanics* **1984**, 51, 742.
- [87] M. Reitman, How Did Timoshenko Concur America, *Nauka-Gazeta.ua (Scientific Gazette, Ukraine)*, May 5, 1995 (in Russian), available at http://gazeta.zn.ua/SCIENCE/kak_timoshenko_zavoeval_ameruku.html, retrieved on September 5, 2016.
- [88] M. Reitman, *American Engineer S.P. Timoshenko*, in *Russkii Uspekhi: Ocherki o Rossianakh Dobivshikhsia Uspekha v S.S.H.A. (Russian Success: Essays About the Russians Achieving Success in the USA)*, (M. Reitman), “Mayak” Publishing House, Boston, MA **1997**, pp. 19–30 (in Russian); also in *Znamenitye Emigranty is Rossii (Famous Emmigrants from Russia)*, (M. Reitmen), Rostov-on-Don: “Phoenix” Publishing House, 1997 (in Russian).
- [89] N. Rogachevsky, The Genius of Bernard-Henry Lévy, *Jewish Review of Books* **2017**, 7, 36, Winters.
- [90] V. A. Sadovnichii (ed.), *Obrazovanie, kotoroe my mozhem poteriat' (Education We Can Lose)*, “URSS” Publishing House, Moscow **2002** (in Russian).
- [91] A. J. C. de Saint Venant, *Historique abrégé de recherches sur la résistance et sur l'élasticité des corps solides. Pp xc-cccj in Résumé des leçons données à l'Ecole des Ponts et Chaussée, sur l'application de la mécanique à l'établissement des constructions et des machines*, 3rd ed., Paris **1984** (in French).
- [92] W. R. Sears, W. Duncan Rannie, Memorial Tributes, National Academy of Engineering, Vol. 4, **1991** (available at <https://www.nap.edu/read/1760/chapter/50>, retrieved on November 7, 2016).
- [93] F. R. Shanley, *Strength of Materials*, McGraw Hill, New York **1957**.
- [94] K. R. Y. Simha, S.P. Timoshenko and His Books, *Resonance*, 45–53, **2002**.
- [95] G. Shibanov, Unified State Examination Inevitability of Degradation, *Pravda*, (30218), 6–9 February, 2015 (in Russian).
- [96] A. I. Solzhenitsyn, A World Split Apart—Commencement Address Delivered at Harvard University, June 8, 1978, available on the web-site OrthodoxyToday.org, <http://www.orthodoxytoday.org/articles/SolzhenitsynHarvard.php> (retrieved on November 21, 2016).
- [97] M.Yu. Sorokina, *Russian Scientific Emigration; 20 Portraits*, Moscow **2001** (in Russian).
- [98] K. R. Sreenivasan, Concluding Remarks on Ludwig Prandtl and Göttingen, available at [users.ictp.it/~krs/speeches.pdf/G8_closing_remarks.pdf](#), accessed on 25 January, 2017.
- [99] V. Tcherapukhin. He was the First in the Pleiades of Outstanding Scientists in St. Petersburg Through Centuries, available at www.300.years.spb.ru/eng/3_spb_3.html?id=81, retrieved on Dec. 19, **2016**.
- [100] S. P. Timoshenko, *Course of Elasticity Theory. Part 2. Columns and Plates*, 2nd ed., A.E. Collins Publishers, St. Petersburg **1916** (in Russian), (Naukova Dumka, Kiev, 1972, pp. 337338, 341).

- [101] S. P. Timoshenko, On the Differential Equation for the Flexural Vibrations of Prismatical Rods, *Glasnik Hrvatskoga Prirodoslovnoga Društva* Zagreb **1920**, 32, 55 (in English).
- [102] S. P. Timoshenko, On the Correction for Shear of the Differential Equation for Transverse Vibrations of Prismatic Bars, *Philos. Mag.* **1921**, 41, 744.
- [103] S. P. Timoshenko, On The Buckling of Deep Beams, Letters to The Editor, *Philos. Mag.* **1922**, 1023.
- [104] S. P. Timoshenko, *The Collected Papers*, McGraw-Hill, New York **1953**.
- [105] S. P. Timoshenko, *History of Strength of Materials, With a Brief Account of the History of Theory of Elasticity and Theory of Structures*, McGraw-Hill, New York **1953**.
- [106] S. P. Timoshenko, *Engineering Education in Russia*, McGraw – Hill, New York **1959**.
- [107] S. P. Timoshenko, *Remembrances*, Association of St. Petersburg Polytechnic Institute Alumni, Paris **1963** (in Russian).
- [108] S. P. Timoshenko, *As I Remember*, translated from the Russian by R. Addis, D. van Nostrand Company, Princeton, NY **1968**.
- [109] S. P. Timoshenko, D. H. Young, *Elements of Strength of Materials*, 4th ed., Van Nostrand Princeton, NJ **1935** (1962).
- [110] J. Todhunter, K. Pierson, *A History of the Theory of Elasticity and of the Strength of Materials*, 2 volumes in 3 parts, Cambridge University Press, Cambridge **1886–1893** (Reprinted New York; Dover, 1960).
- [111] C. Truesdell, Review: V.V. Novozhilov, Foundations of the Nonlinear Theory of Elasticity, *Bulletin of American Mathematical Society* **1953**, 59, 467.
- [112] C. A. Truesdell, Timoshenko's History of Strength of Materials, *Mathematical Reviews* **1953**, 14, 1050.
- [113] C. A. Truesdell, *Essays in the History of Mechanics*, Springer, Berlin **1968**.
- [114] C. Truesdell, *An Idiot's Fugitive Essays on Science: Methods, Criticism, Training, Circumstances*, Springer, New York **1984**.
- [115] C. Truesdell and W. Noll, *The Non-Linear Field Theories of Mechanics*, (Vol.3, Enclopaedia Physics), Springer, Berlin **1965**.
- [116] J. Vogel-Prandtl, Ludwig Prandtl: A Personal Bio Drawn From Memories and Correspondence, Universitätsverlag Göttingen, **2014**.
- [117] V. Vernadsky, The First Year of the Ukrainian Academy of Sciences (1918–1919), *The Annals of the Ukrainian Academy of Arts and Sciences in the U.S.* **1964–1968**, 11, 3.
- [118] W. G. Vincenti, NASA Headquarter, NACA Oral History Project, Edited Oral History Transcript, interviewed by R. Wright, Palo Alto, (A, July 15, 2014 (available at www.jsc.nasa.gov/history/oral_histories/NASA/VinentiWG_7_15_14.htm, retrieved on January 16, 2017).
- [119] V. Z. Vlasov, *Thin-Walled Elastic Beams*, Israel Program for Scientific Translations, Jerusalem **1961**.
- [120] T. von Kármán, Über die Grundlagen der Balkentheorie. *Abhandlungen, Aerodynamische Institut TH Aachen* **1927**, 7, 3 (in German).
- [121] T. von Kármán, *From Low-Speed Aerodynamics to Astronautics*, Perdaman Press, New York **1961**.
- [122] T. von Kármán, J. M. Burgers, *General Aerodynamic Theory*, Vol 2, Springer, Berlin **1935**.
- [123] E. Weiner, *Geography of Genius; A Search for the World's Most Creative Places From Ancient Athens to Silicon Valley*, Simon & Schuster, New York **2016**.
- [124] R. G. Weingardt, Stephen Timoshenko, *Leadership and Management in Engineering* **2008**, 8, 309.
- [125] D. S. Wyman, *Paper Walls: America and the Refugee Crisis 1938–1941*, Amherst, Ma **1968**.
- [126] P. Schneider, R. Kienzler, On Exact Rod/Beam/Shaft Theories and the Coupling Among Them Due to Arbitrary Material Anisotropies, *Int. J. Solids Struct.* **2015**, 56–57, 265.
- [127] A. Sommerfeld, Zum hundertsten Geburtstag von Felix Klein, *Naturwissenschaften* **1949**, 36, 289 (in German).
- [128] H. Kneser, Felix Klein, *Archiv der Mathematik* **1948**, 1, 413, (in German).
- [129] T. von Kármán, M. Born, O. Hahn, W. Westphal, Von Fünfzig Jahren: Persönliche Erinnerungen, *Physikalische Blätter* **1960**, 16, 22 (in German).
- [130] J. Zierep, Ludwig Prandtl, *Leben und Wirken*, in *Ludwig Prandtl, ein Führer in der Strömungslehre*, Vieweg, Berlin **2000**, pp. 1–16 (in German).
- [131] B.-J. Zhu, Timoshenko-Father of Engineering Mechanics, blog in iMechanica, available on World Web Site <http://imechanica.org/node/1488>, retrieved 27 May, 2007.

How to cite this article: Elishakoff I. Stepan Prokofievich Timoshenko and America. *Z Angew Math Mech.* 2019;99:e201800338. <https://doi.org/10.1002/zamm.201800338>