

Thaddeus B. Massalski

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The scientific achievements and research contributions of professor Thaddeus (Ted) B. Massalski cover very broad, fundamental areas of materials science and solid state physics. They range from alloy phase structures and stability, to phase transformations, particularly the massive transformation he discovered, martensites, phase diagrams and thermodynamics, amorphous alloys, magnetic materials and even plutonium. His achievements were summarized and praised many times on the occasions of nearly endless series of recognitions, awards, honors and distinctions he received during his academic carrier. The important source of knowledge about this seminal contribution is the symposium held at Carnegie Mellon University in Pittsburgh to honor professor Thaddeus B. Massalski on his 75th year, and published as a special Festschrift of Progress in Materials Science (vol. 49, 2004)

So, instead of merely talking about the research contributions of Ted Massalski, I would like to focus your attention also on the impulses which shaped his position in science, as we can learn something important from this.

Ted was born here in Warsaw, 80 years ago. He was 13 year old when the WWII started. The life of Polish teenagers in this very place of Europe under Nazi occupation can be well imagined to have been unusual. But in Ted Massalski's case it was even more unusual than that of many others, and his life story certainly could fill a book which I hope he will publish one day. In brief: at age of 16, and already fluent in English, he escaped from occupied Warsaw, followed a long and dangerous way through Germany and Austria to Switzerland and then, via Marseilles, to southern Italy where he joined the Polish Army Corps of the 8th British Army fighting there. When the war ended, Ted started his college education first in Italy, in Italian, and finally at Birmingham University, where in 1954 he obtained his PhD in Physical and Theoretical Metallurgy, thus beginning his successful adventure with science.

I am recalling these early vignettes of his life to show that Ted belonged to the very specific, highly motivated generation of young people who after the war were ready to change uniforms for gowns, and swarmed to universities to become the actors in an explosion of university studies and research activities that characterized the post-WWII era. This was incidentally also the breakthrough period in setting the intellectual foundations for the modern basic approach to materials, the Materials Science.

The process of transformation of metallurgy from an art to a science was turbulent and took quite a long time. Such transformations usually need the engagement of three succeeding generations. We can name them “prophets”, “founders” and “followers”. The first involved an era of “prophets”, who sensed the need for a change and postulated new ideas. Among them we can count for example Walther Rosenhain in UK, who at the end of WWI predicted the emergence of “Physical Metallurgy” and, what is much less known, also Jan Czochralski, who at the same time was advocating the “Metallkunde” as an independent scientific discipline.

Next came an era of “founders”, who laid the foundations for what we now label Materials Science. They came from different fields: metallurgy, physics, physical chemistry, crystallography and mechanics. Many of them during the WWII period were working in governmental or industrial research establishments. This appeared to be an important experience which helped them to identify the problems in the understanding and applications of materials and to join efforts in setting the intellectual bases and rules of the new discipline, and in creating educational and research platforms for the first followers. The group of “founders” was relatively small, numbering perhaps one or two dozen people at just a few universities mainly in the USA and UK - as the continental Europe was then still healing the wounds of war. In UK the most important and influential places in the early fifties were Birmingham University with professor Alan Cottrell (born 1919), Bristol University with professor Nevill Mott (b. 1905) and also Oxford University with professor William Hume-Rothery (born 1899).

So, when Ted Massalski came to Birmingham he found himself right in the centre of this turbulent pioneering activity. The supervisor of his thesis on the stability of alloy phases was Professor Geoffrey Raynor, a student and co-worker of Hume – Rothery, who in turn was one of the most important figures among the “founders”, pioneering the electronic theory of metallic alloys, authoring the very influential and famous textbooks.

It was a stroke of incredible luck that Ted found himself at the right place at the right time, surrounded by the most challenging and creative people, tackling the most challenging topics. From the very beginning this placed him at the forefront among the first generation of “followers”, destined to define the scope and explore the limits of the Materials Science field, and finally to make it come into its own as a coherent academic discipline. However, it was not purely luck, but the personal driving force and curiosity which allowed Ted to face this challenge and fully take advantage of the opening opportunities.

In 1954, Massalski was invited by another big personality among founders, professor Cyril Stanley Smith (b. 1903), for the postdoctoral fellowship in the newly created Institute for the Study of Metals, University of Chicago, where he worked with another founder, professor Charles Barrett, on the phase transformations of alloys. This resulted additionally in coauthoring with Barrett of the new, completely rewritten and updated, third edition of already famous Barrett's book "Structure of Metals" (1966), which since then became a classical textbook, translated into many languages and is still one of the most quoted textbooks in the field.

In 1959 Massalski settled for good in Pittsburgh with institutions which in 1965 become the Carnegie-Mellon University where he eventually became a Professor in three disciplines of Materials Science, Engineering and Physics. But, his active approach to these fields didn't allow him to stay put. The spirit of pioneers inherited during the early days was moving him all over the globe as a visiting professor, invited lecturer, or visiting scientist, playing everywhere the role of *spiritus movens*. He lectured on numerous topics all rapidly growing in new directions and involving alloys, thermodynamics, crystal structures, solid state transformations and physics of metals.

Ted Massalski spend the winter of 1968/69 as a visiting professor at Harvard with professor Bruce Chalmers (b 1907), who played the central role in preparing the ground for developing the Materials Science and was one of the most influential "founders". Chalmers studied the structure of grain boundaries and crystallization processes, and in 1949, founded a series of review monographs entitled "Progress in Metal Physics," which in 1961 was renamed as: "Progress in Materials Science". This series, shaped and edited by Chalmers attracted a very distinguished group of contributors mainly from emerging younger generation and was, and still is, one of the most important and influential tools in defining the crucial topics of materials science particularly at the level of graduate education. Massalski joined Chalmers in this editorial task in 1969, filling the gap emptied by Hume-Rothery who for some time was the co-editor. Ted continued this responsibility for decades, joining later with Jack Christian and Peter Haasen, becoming the longest serving co-editor of the series. He is also closely tied with *Acta Metallurgica* (now *Acta Materialia*), which together with the Progress volumes set the standard for research in the field. The *Metallurgical Transactions A* was another trend-setting journal for which Ted is acting as a co-editor. This editorial activity of Ted must be highly praised also for its effect in promotion of the next generation of researchers.

In the late 1970's, Ted Massalski tackled yet another task, that of putting out a new series of assessed phase diagrams of alloy binary systems to replace the "pre-war" Hanson. To accomplish this, he assembled a devoted group of "category editors", some 34 in total. Their task was not only to re-assess and cover the world literature on phase diagrams, but also to be guided by the recognition that phase diagrams are based upon the laws of thermodynamics and must conform to these laws to be of value. The resulting sets of orange-colored volumes can be found in any advanced materials science library in the world.

Professor Massalski's position not only as a scientist but also as an educator, editor and organizer, as well as his personal input in the formation of contemporary Materials Science is recognized internationally by numerous Fellow and Member elections offered to him by many scientific societies. Among the long list of honors and awards there is one which I would like to mention particularly, namely the honorary doctorate he received here, at Warsaw University of Technology in 1973. The ceremony took place in this very hall, Ted being the 26th recipient of this distinction. This makes his personal link with Jan Czochralski who, forty five years earlier, in 1928, was the 8th recipient of the same honor.

And now, at his eightieth birthday Ted is the same as he was when I meet him for the first time many years ago: active, optimistic and full of ideas.

We can learn from the story of Ted Massalski, that the most important condition which makes a great scientist is not only the skill in analyzing the specialized structure of particular objects, but also the feeling of responsibility for the whole field inherited from the previous generation and the care in the formation and nurturing of his own followers, as well as an ability of showing them the way how to advance and contribute to their own topics and directions. It is the natural way of protecting the continuation and integrity of science. I am told that 23 of Ted Massalski's Post Doctoral Fellows are now full Professors somewhere in the world. So, in a way, the earlier "followers" become new "founders". I am afraid that in the present days of extremely narrow specialization and impersonal contacts between people working in the current research environments we are loosing something of great value.

Maciej W. Grabski