

# MATHEMATICAL TEXTBOOKS IN VERNACULAR LANGUAGES

## The Case of Czech Textbooks and Their Development in the 16 th c

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1. First stages of the development of mathematics were introduced on the beginning of cultural development of mankind only in vernacular languages. Mathematics of ancient Egypt, Mesopotamia, Greece was developed and its results were written in languages which were understandable to the majority of inhabitants of that countries. It depended only on the cultural level of them. With religious institutionalized education in Arabian and Latin cultures and its broadcasting in countries with different vernacular languages, mathematical culture became separated from local culture. The further development of mathematics occurred the separated from the local illiterate people. The culturally lower ranks of inhabitants needed only elementary parts of reckoning practice and that was broadcasted among them mostly by tradition.

Counting with fingers, with score sticks, with abacus, with apices or coins signs, were used up to the begin of 20th century even in very developed countries (1)

(1) Special research by the programme of ethnomathematics gives us more exact pictures of this arts of counting in low developed countries up to now.

During the 17th and 18th c. when European mathematics had overtook the leading role in the world development of this subject, one left also in "learned mathematics" Latin and started publishing in vernacular languages. All these changes came about with substantial changes by the end of the feudal system and were connected with the growing forces of urban population, especially merchants and artisans. Great antifeudal uprisings caused growth of literacy among urban inhabitants.

New conditions for trade and handicrafts started with the 14th c. in Italy and during the next century, and spread following the trading roads, reached to all main centres in different countries of Europe. The need of education for artisans and merchants caused establishing a system of nonconfessional schools. The first need of those social ranks - in the area of our interests - was the ability of counting different kinds of economical and technical problems. It helped emerge - for first time after the ancient Museum of Alexandria - mathematicians working professionally. In first stages this helped the town-reckoners: in Germany called "Rechenmeister" in other countries "arithmeticians". They were organized into special guild corporations in areas where the trade, handworking and handicraft were very developed.

The trade intensification was not accompanied with - speaking in modern terms - normalization, with unification of measures, weights, money and prices. They were different almost in every town. Tasks of the town-reckoner in the first stages were to help the young future merchants in orientation with reckoning in domestic units and to solve reckoning problems of local origin: interest account, rates, portion of inheritance, profit or loss of some enterprise, but also some geometrical knowledge needed in surveying.

Another task was added maybe later, teaching the reckoning praxis to young artisans and merchants and their children. This means to all who had no need of Latin education in confessional schools, but demanded knowledge of reckoning methods and practice of solving problems. For example in Annaberg in German Saxony was opened a reckoning school (Rechenschule) in 1525 by the arithmetician Adam Ries. And it was the only school from several in the town existing, which was under municipal authorities and had the special rights given by the town. Similar municipal (but Latin) schools were in the same time founded on the Czech territory at the opposite side of the border at Jáchymov. Both were instigated by the great

silver-run to those localities of the time.

Afterwards the education in those schools became connected with normal trivium too, and also reading and writing were on taught in the reckoning-schools in vernacular languages, or the common trivium-programme was introduced by the schoolrector from the beginning already.

Institutionalization of teaching in vernacular languages implied the need of corresponding textbooks. This was the starting point of further development of higher education and also of "learned mathematics" written in local languages.

## 2. Bohemian Lands and their neighbourhood.

First we shall put our attention to Czech practical arithmetics, we have to describe the situation conditioning the forming of that kind of mathematical literature in Bohemian Lands. "Czech Lands" or more exactly "Lands of Czech Crown" were from the 9th century one of the few European countries borders whose were not substantially changed during the next ages. Temporary fusions were done mostly from dynastic interests, but the nucleus was stabile and in comparison with relative small mutually independent other dwarf countries constituted one of the greater countries on European continent of that time.

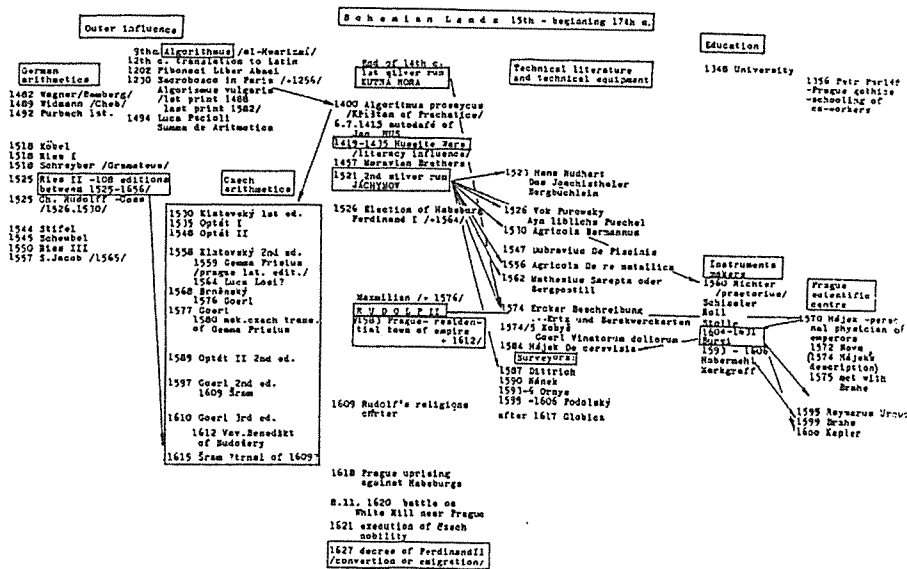
After the first Czech dynasty of Premysliden the Luxembourgian dynasty came with great interests on the Czech throne in 1310. John the Blind was the first, and his son - the later Roman Emperor Charles IV (ruling 1346-1478) was the next of them. By Charles initiative and on the good base of educational tradition of Bohemian Lands he founded in Prague in the year 1348 the first university in the space northern of the Alps and eastern of the Rhine. In Charles time, too, one started construction of almost all the famous gothical buildings in Prague. With constructing the gothical cathedrale on the Prague Castle was also connected a technical training of builder-masters.



With the end of the 14th c. were opened the silver mines in Kutná hora the richest source of silver ore in Europe of that time. But very shortly after auto-da-fé of John Hus in Constance the hussite reformation broke out and the twenty years Hussite-Wars with the crusades began.

This part of Bohemian history was very important for the whole cultural advancement of the country, by increasing the literacy of inhabitants and it was followed by the educational system of Czech (Moravian) brothers (founded 1457). One could observe similar developments in other European countries standing under influence of reformation.

A second silver run broke out after opening the mines at Jáchymov (1521) on the south parts of Krusné hory - hills and in the same time on the northern slopes of it in also newly founded Saxonian town Annaberg. Among 18 thousands miners who came to Jáchymov were also personalities who were able to describe and then publish (and such a way perserved for us) the quite new mining and metalurgical technologies used there: Physician Agricola, priest Mathesius and technician Ercker wrote books which became classic for a long time. The time of economical growth lead to progress in other handicrafts, in agriculture, and in greater investments. In southern Bohemia, Jakub Krcín of Jelcany created a great system of ponds, which was watered by artificial so called "golden drain" some tenth of km long. The aim was to establish fish production. The system is working up to now. Without progress in surveying instruments and methods this functioning would have been impossible. Dubravius' book about pisciculture and Hájek's about brewing show that the technological literature had emerged, partly in Latin, partly in German.



Technical achievements, economical prosperity, trade boom, increasing of living standard and also, compared with other parts of western Europe, more ideological tolerance called new and new people to Bohemian Lands and to Prague, at the Emperor's court. Especially from the time of Rudolf II. Prague was one of the great European scientific and cultural centres.

It was a great personal achievement of Tadeáš Hájek - the personal physician of Emperors - mathematician and astronomer, that by the end of 16th c., Tycho Brahe, Joannes Kepler, Joost Burgi, Raymarus Ursus and other outstanding scientists of that time were invited to the court at Prague.

This was one achievement of the economical growth and ideological tolerance. But we shall turn our attention to another result of that social and economical development.

### 3. Czech practical arithmetics.

Parallel to the mentioned technical literature appeared also practical arithmetical textbooks in Czech language, almost in the same time as the German ones in Saxony.

a) General mathematical conditions of Czech arithmetics.

If D.J.Struik told that the new centre of practical arithmetics were at that time the Italian towns and Nuremberg, Prague and Vienna in middle Europe and that arithmetics and algebra were taught there by arithmeticians without contacts with universities, he is only partially true. The Italian arithmeticians "maestri d'abaco" were really practitioners like Saxonian Adam Ries, but among authors of Czech arithmetics we find university graduates as well as educated artisans (e.g. printers).

In Saxony there were the very successful arithmetics books containing reckoning on lines and with numbers by Adam Ries. Especially his second book of 1525 enjoyed during 126 years at least 108 editions, which comparison has not yet been done, but some were shown at the conference prepared in 1992 commemorating the half millenium of Adam Ries. It seems that the editions changed according to local and time conditions. Ries' first book devoted only to reckoning on lines got only three editions. Ries' second textbook and its adaptations were broadcasted in such a great number that, in Germany, saying "nach Adam Ries" is very popular and has similar meaning like originally the term "algorithmus"- developed also from the name of mathematician.

"Algorithmus" - rules for arithmetical operations, in 12th c., and translated into Latin and broadcasted since beginning of 13th c. in many different versions - was the theoretical background of all textbooks of reckoning in vernacular languages. John Holywood (nicknamed Sacrobosco) and at the same time Jordanus Nemorarius prepared manuscripts of "algorithmus" which were used in universities, transformed by many authors and printed already by the end of 16th c.

We do not know the names of mathematics teachers at the beginning of Prague University, but we know that about the year 1360 three weeks there were devoted to teaching the "algorithmus". General formulations of those types of manuscripts caused, that they could be used over more than 350 years.

## Titles of Czech elementary arithmetics 1530 -1615

<b>KLATOVSKÝ</b> /1530,1558/ Nové knížky vo počtech na cifry a na liny, přitom některé velmi užitečné podle bůhu kupeckého krátce a užitečně sebrána	/ 1504-1551/ New booklets on the reckoning with numbers and on the lines, with some rules and examples of different coins - as to the benefit of trade run-briefly and usefully collected
<b>OPTÁT OF TELČ</b> I /1535/ Isagogicon jenž je první uvedení každému počínajícímu se učiti a to ku poznání dvojí každému velmi potřebného umění ... orthographii ... arithmetiky...	/ ? -1559/ Isagogicon, which creates an introduction for everybody who begins with learning, namely for cognition two very desirable arts ... orthography first... arithmetics after it...
<b>OPTÁT OF TELČ</b> II /1548,1589/ Knižky početní na rozličné koupě v nově vytištěné. Při tom kterak se jeden každý mince čísti a učiti má o čem druhé stránka listu tohoto ukazuje	The reckoning booklet for different trade - new edited. With introduction how the coin may be read and learned what the next page of this leaf shows
<b>MIKULÁŠ BRNĚNSKÝ</b> /1568/ Kniha v níž obsahují se začítkové učení aritmetického, to jest počtův na cifry neb liny pro pacholátka a lidi kupecké sebrána	/1500?- ? / Booklet which contains the beginnings of arithmetical arts, i.e. the reckoning with numbers or on the lines; for little boys as well as for merchants collected
<b>GOERL OF GOERLSTEIN</b> /1576/ Ein nutzlich und künstlich Rechenbuch auf den Federn...	/1550 ? -after 1588/ Needed and artistic reckoning book with numbers...
<b>GOERL OF GOERLSTEIN</b> /1577,97,1610/ Arithmetica to jest knížka početní neb umění počtův na lincech a cifrách skrze exempla a mince rozličné všem v handlech v ouředech a v hospodářství se obírajícím velmi užitečná a prospěšná	/1577,97,1610/ Arithmetica i.e. the reckoning book or the countingart on the lines and with numbers, which - according to its examples and different coins - will be very useful and serviceable to everybody who works in trade, office and farming
<b>FAVEL ŠRAM</b> /1609/ ? Die Arithmetik ...?	/ ? - ? / ? Arithmetica ...?
/1615/ ? Aritmetika, knížka počtův, přeložená do řeči moravské ...?	? Arithmetica the reckoning booklet translated into the Moravian language

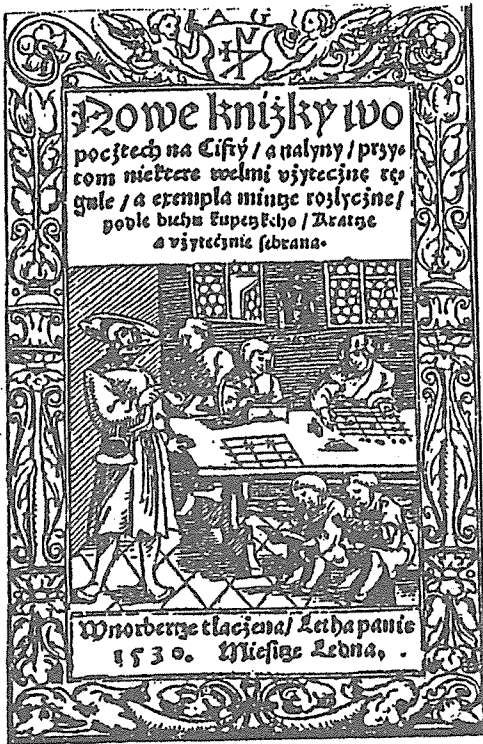
We should consider practical arithmetics like applications of "algorithmus" on problems of everyday life with addition of some special reconting methods. Therefore, the time of use of a textbook was limited and depended on localities, on units, prices, weights, measures, goods etc used at that time. And the change of units or rates made the textbooks only partially useful. In Germany, where the Ries tradition predominated, the local - and time - interpretations were done in Ries' textbooks self.

In Bohemian Lands Czech arithmetics started in 1530 and during 85 years (up to 1615) 10 Czech textbooks by five authors were edited. Time distance between two neighboring editions was 9-10 years. (2) It seems to be "a normal" time-need for a new textbook.

(2) There were two greater irregularities in 13 and 5 years intervals, which were in mutual following places and can be averaged to "9".

We have to add, that there were also other practical textbooks edited in Prague in Latin (e.g. Gemma Frisius 1559 and Luca Losi 1564) or in German as well as the Latin one of a domestic author (Benedikt of Nedouzery, 1612).

b) Ondrej Simkovic called Klatovsky of Dalmanthorst



The author of the first Czech arithmetics was Ondrej Klatovsky. He graduated from Prague University and then he belonged to the circle of humanistic intellectuals concentrated around Matous Collinus of Chotěrina, professor of classical languages at the university and in the same time rector of his own private school in Prague. It was very probably, that Klatovsky taught at Collinus' school and was stimulated by him to write an arithmetics for those purposes. It is known, that the edition of Klatovsky's book was supported by sponsor of the circle Jan Hodějovský of Hodějov.

The contents of this practical arithmetics served without doubts as a model for next Bohemian authors. In opposite to Ries' German and to the next Czech reckoning textbooks, Klatovsky started with modern operations with numbers and only after it, in the second part of the book, he elucidated reckoning on lines - more common at that time. Maybe, it was an attempt of a university graduate to bring new progressive methods, which were taught at the university, to common life of artisans and merchants. But from a methodical point of view, for the situation which existed in the practical life of the time, it was more needed to begin with common known and used lines-counting. Reckoning with lines did not need writing and also counting by heart was minimized by it. Even Adam Ries in his third textbook from 1550 wrote, that he came to the conclusion, that reckoning with lines at the beginning of learning of a young counter trained him better in counting ability than reckoning with numbers.

Klatovsky's arithmetics, after these two kinds of elementary computing technics, described in a third part fractions and in a fourth examples of different practical problems.

Contents of Klatovský's Arithmetics (1530, 1558)

- (1) Reckoning with numbers
- (2) Reckoning on lines
- (3) Reckoning with fractions
- (4) Examples of different practical problems:
  - signs and units of common used coins and weights
  - exchange rates of different money and their units  
(czech, nurembergian, meissenian, austrian, salzburgian, bavarian, swabian, hungarian)
  - transmission of measures of capacity of vine and grain in Bohemia and of vine in Nuremberg
  - transmission of weights were considered among Nuremberg, Leipsic and Prague in so called "great weight" and "weight of spices"
  - rates among measures of cloth
  - transmission of gold money to silver money
  - introduction of special units for 60 pieces "kopa" (i.e. "threescore") or for 15 pieces "mandel" (i.e. "fifteen") and the units of time
- (5) General rules:
  - Regula de tri ... Regula Quinque (i.e. double trinomial)
  - Regula societatis
  - Tollet
  - Regula on buying for buying (barter trade)
  - Regula "on usury" (in czech "lichva" i.e. interest account)

Already in the first part, we find many facts which have more practical character:

- signs of used coins and weights
- exchange rates of different money and their units (Czech, Nurembergian, Meissen, Austrian, Salzburgian, Swabian, Bavarian and Hungarian)
- transmissions of measures of capacity of vine and grain in Bohemia and of vine in Nuremberg.
- transmissions of weights were considered among Nuremberg, Leipsic and Prague in so called "great weights" and "weights of spices"
- also rates among measures used for clothes were introduced
- transmissions of gold money to silver one
- special unit "kopa" (i.e. threescore) was introduced as well as "mandel" (i.e. fifteen)
- units of time

In the last part Klatovsky introduced a few particular examples for every general rule and used also the mentioned rate tables. The simple exercises concerned the paper, vine, cloth and soap.

Progression was exercised on salaries for tower construction, for delivery of news from Prague to Buda and to the regula de tri he gave only few examples adding that the next would be introduced in the part devoted to the "reckoning on lines". And there are also rules for double trinomials (regula quinque), which he considered as exceedingly difficult. In fact in the part devoted to the line-reckoning are all species newly elucidated and with further examples exercised.

The fourth part of the textbook is full of material concerning the economical processes. Every group of examples is introduced with general explanations. In the first place is "Gesellschaft jez slove tovarysství" i.e. regula societatis: more partners who participate in the same enterprise with different time or money proportion and their share on the profit or loss with taking in account their part of the complete (or uncomplete) work.

In this part is also introduced some inheritance reckoning, e.g.: Last will of a man, whose wife was pregnant in time of his death: If the wife would give a birth to a boy then three quarter of the inheritance would come in the boy's property and the rest to the mother's: if she would give birth to a daughter, then the daughter's share would be a third and the mother's the rest. But the wife, after her husband's death gave birth to twillings, a boy and a girl. The question is: how to divide the inheritance according to the Last will.

Other groups are devoted to the reckoning of metal mixtures, to money exchanges, payment of merchants debts to abroad (e.g. between Prague and Leipsic or Prague and Nuremberg or between Vienna and Buda), rules for reckoning of profit and loss were exercised on buying and selling under different conditions and with taking in to account all other expenses.

Special attention is paid to examples of goods-exchange, so called "regula o koupi za koupi" (what means the rules about buying for buying- we shall say today the barter-trade) e.g.:

wool for cloth, cloth for vine, vine for silk, but also pepper for linen or pewter for herrings.

Some pages of the textbook are devoted to reckoning of gold and silver in some mixture (tollet-counting), where the difficulties were caused with special weight-units of each of them. At the close of the fourth part examples "on usury" are concentrated. We shall analyzed more complicated ones.

Example on compound interest by Klatovský

Jeden měšťán vypůjčil sobě v židech na lichvu 350 zlatých českých od jednoho žida ,kterýžto na ten způsob mu půjčil, aby každý rok ze sta zlatých dal 6 zl. a druhý rok z těch 6 zl. zase lichvu tak dlouho, pokud by jich užíval. Ten měšťán užíval těch peněz 4 léta. Otázka, co musí tomu židu z té hlavní sumy lichvy a lichvy z lichvy dátí?

One citizen leant 350 at six percent yearly /i.e. every year he have to return for each hundred 106 and next year again 6% from this 106 so long how long he will use the loan/. What interest ist to pay and interest from interest for 4 years?

Solution: Take 100 4times and multiply it mutually

you received  $/100/4$  i.e.  $10^8 = 100\ 000\ 000$

Do the same with profits of 100 /i.e. 106/ 126 247 696

From  $10^8$  you will receive  $106^4$

What do you receive then for 350

Use the trinomial rule:

$$350 \frac{106^4}{10^8} = 350 \cdot 1,26247696$$

$$= 441,866936$$

If it is written in gold coins, then debtor have to pay:

441 gold coins 52 groachen and 707/ 3125 parts of "small coins"

This example shows how the trinomial rule was used for more complicated cases. But what regarding the example itself, we must consider that similar cases have already been solved before Klatovsky (see the old egyptian or mesopotamian texts).

In his arithmetics Klatovsky did not analyse the rules for reckoning the square and cube roots (radix quadratum et cubitum) because - according to his opinion- those operations are solved by "Reguli Cosse and Alligationis" and it was his intention to write a special book devoted to them. Unfortunately there are no signs that he had really written such a booklet or even started with it.

c) Jirí Mikuláš Brněnský



Despite the fact that Klatovský was not a reckoner-practitioner in Struik's sense like Adam Ries, his Czech arithmetics was used even in German schools in Bohemia and became a model for the next one. Klatovský died after 1551 and the second edition of his textbook was printed, with only small changes, probably after his death. The greatest change is the addition of three new examples at the end of the book.

Almost twenty years after Klatovský's withdraw from Prague in 1547 the mentioned private school of Collinus received a new teacher: Mikuláš Brněnský. He taught there and after Collinus' death (1566) he organized himself his own reckoning-school at Prague, and for this purpose he wrote an own arithmetics. If there were influences of Charles university of Prague on Klatovský, Brněnský as graduate of Wittenberg university (1556) was without doubts under the influence of German arithmeticians. Maybe that this was the reason why he started the book with reckoning on lines and treated numbers only afterwards. Influence of Klatovský is proved already by the title page where the picture from the title sheet of the second part of Klatovský's arithmetics is used. And Klatovský's pictures were used in other places of Brněnský's textbook, too, and also some parts of the text are identical.

Brněnský taught after his return from Wittenberg about six years in the school in Moravian metropole Brno and two years before his departure for Prague he was schoolmaster in the Moravian town Úsov. Brněnský is known in the literature on the history of mathematics by his nickname Brněnský determined by his Moravian working - place, but in the introduction of his book one finds the dedication: to his brothers, sons of honorable Sir Jindřich Mikuláš from Hasistějn and Lobkowicz. According to it his name is Jirí Mikuláš of Hasistějn and Lobkowicz.



The example in the figure is following problem: somebody wishes to buy three kinds of animals for 40 groschen. When the price of one goose is 2 groschen, of one chicken 1 groschen and for 2 pigeons he had to pay 1 groschen. The question is how many of every kind of animals he can buy. We know the problem could be solved by a system of two indeterminate equations:

$$x + y + z = 40 \quad / \cdot (-1)$$

$$2x + y + z/2 = 40 \quad / \cdot 2$$

$$3x + y = 40$$

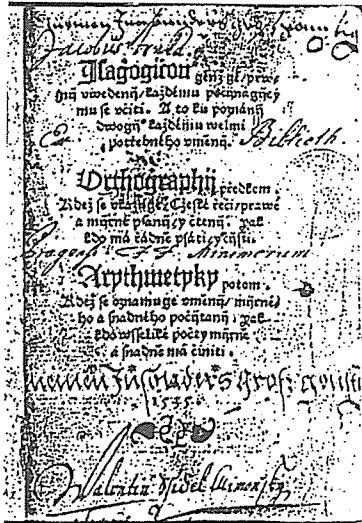
and the solution in whole numbers depends on the choice of  $y$  or  $x$ . All solutions are:

x	1	2	3	4	5	6	7	8	9	10	11	12	13
y	37	34	31	28	25	22	19	16	13	10	7	4	1
z	2	4	6	8	10	12	14	16	18	20	22	24	26

The solution given by Brněnský is done with the help of regula falsi and therefore shows only one possible case, and also the choice of the number of animal-kinds has not been quite by free will. In the picture we see also the systematical use of signs (+) for plus and (-) for minus as the signs for excess or insufficiency and it is the first use in Czech textbooks (first time in printed textbook it was used in Widmanns' German one of 1489).

Brněnský's textbook in comparison with Klatovský's, contained more examples and the whole text shows great methodical experience of the author.

#### d) Benes Optát of Telc



FRONT COVER OF ISAGOGICON (Benes Optát z Telce 1535)

IREM de LYON  
BIBLIOTHEQUE  
Université Claude Bernard - LYON I  
43, Bd du 1<sup>er</sup> Novembre 1918  
69622 VILLEURBANNE Cedex

Brněnský was only the third author in the chronological sequence. The second was Benes Optát, priest of Moravian Brethers, who came to the castle Náměst nad Oslavou at the invitation of the local landlord Mezirický. He was acting there like a private teacher of local nobility children. He translated the New Testament into Czech and edited it in Náměst at 1533. Parallel, in the same year, he wrote the Czech grammar as a consequence of his work on translation of the New Testament and it was the first Czech grammar at all and the impuls for Jan Blahoslav, also bishops of Moravian brethers, for creating the fundamental Czech grammar of the year 1571.

From the private teaching of Optát originated also "Isagogicon", a textbook of orthography and reckoning. Both editions (1535, 1548) are identical with exception of 20 more examples supplemented to the last one. The booklet was used even at the end of 17th c. The main difference of both editions is in the title, but both started with Czech grammar and half of them is devoted to elementary arithmetics.

Although Optát remarked that reckoning with numbers is quicker, all arithmetical operations are elucidated on lines and only afterwards also with numbers. Second part of his arithmetics is concentrated on special rules: regula de tri, regula societatis, regula quinque, different rules used by shopping, rules of hundreds and thousands, rules on profit and loss and rules of money-change. On the end of the book examples were added called "rychant", which are more for pleasure of readers e.g.:

One goose was sitting on the grass and a lot of others were flying over her. She told them:

Dear geese, how many are you? They answered: If we would be twice more and a half and a third of it, even then we would be hundred. How many geese were flying.

This example has been borrowed from the second edition of Klatovsky's book. As regards the contents, the arithmetical part of Optát's book is more elementary in comparison with other textbooks, but has one priority - the grammatical part separated for first time in Czech written textbooks the teaching of the national language from religious teaching. Maybe the lower standard of this booklet as well as its connection with grammar made the book very popular especially in schools of the Moravian Brethers.

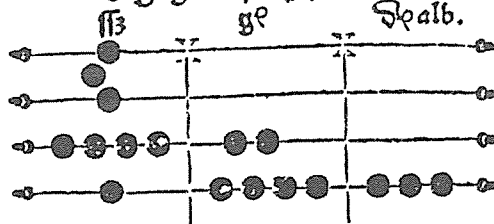
e) Jirí Goerl of Goerlstejn.

JIRÍ GOERL Z GOERLSTĚJNA (1577)  
ADITIO & SUBTRACTIO "ON THE LINES"

o počtu na Linách. VI.

Da	Žito	1 2 5 flz	1 2 9 <sup>e</sup>	4.	} De alb
	pšeniцы	2 3 4 flz	1 6 9 <sup>e</sup>	5.	
	Bečmen	4 5 0 flz	2 0 9 <sup>e</sup>	2.	
	Oves	1 7 6 flz	1 0 9 <sup>e</sup>	0	
	Brách	6 5 4 flz	2 4 9 <sup>e</sup>	6.	
facit		1 6 4 1 flz	2 4 9 <sup>e</sup>	3.	De alb.

V figúře stogij takto:



Proba Addycy gest Subtrakcy.

Odegmí každý počet kterýžs položil/ ne  
zvořtaněl nic/ dobře učinit.

## Subtractio.

T:etij spůsob Arithmetyky / slove od-  
gymání, neš odřhowání/ gest geden pos-  
čet od druhého odgymati neš odřhowati/  
a to menšij od většijho/ aby poznati mo-  
hl/ co gest počtu zůstatého.

Whereas the first three authors of Czech arithmetics books were academically educated, the next two were practitioners-reconers. Jirí Goerl was German origin from the family of town Loket (north-west Bohemia)

D.E.Smith (*Rara mathematica*, 1908 pp 353-4, and *History of mathematics* vol I, New York 1923, reprints 1951,1958) introduced this textbook as the only one of those mentioned by us, but he considered the author "Görl'z Görlssteyn" as a Polish and the locality where it was published as -instead Prague- Czerny, actually the name of the printer in Prague.

In years 1566-7, during his stay with his relatives in Litoměřice, Goerl learnt Czech. He entered the Latin school and decided himself for a career as arithmetician and settled then at Prague. Because the German reckoning books were unsuitable to the conditions in the Bohemian Lands - if we use his words from the introduction - he decided to write own German book at 1576 and dedicated it to the Emperor Rudolf II. Goerl obtained a noble predicate for it and in his heraldic signs arithmetics was presented as a girl with pen and compass. Afterwards he worked as municipal notary and a clerk in St. George monastery of Prague, too.

The Czech edition of 1577 is not the translation of the German predecessor but a very free revision. Some important parts of the German one were not adapted to the Czech edition, and also the whole structure was changed.

Goehrl's German textbook contains:

1. Species. The rules of it were versificated. Only numeration and addition were presented also in reckoning on lines, all other operations only "on numbers".
2. Coss "Regeln durch welcher Erlernung man der edlen und sinnreichen Regel Algebrae (so geweniglich Coss genandt)... (Rules with which one learned the fine and reasonable regula algebrae (commonly named Coss)).
3. Different examples from merchant - practice. He mentioned the next book "Practica", but, unfortunately it has not been published.

Goerl's Czech arithmetics is divided into five parts:

1. Reckoning on the lines
2. Reckoning with numbers
3. Reckoning with fractions
4. Rules on all coins
5. Regula falsi and examples for the readers' pleasure

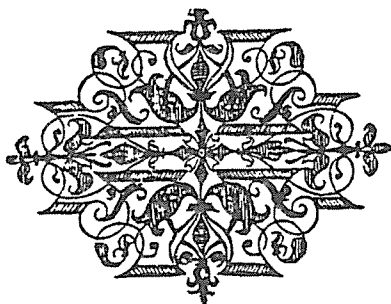
The Czech book is more elementary and some parts of the German edition were not incorporated into it. E.g.: Coss, reckoning the square - and cubic roots, regula tollet etc. Reckoning of percent and some other parts were quite different in both books (profit and loss, regula quinque). But the Czech book is the only one of all mentioned, where one finds quotations of other authors: Apianus, Stifel, Risius, Frisius, Rudolff and Euclid. And from Goerl's notices one can see, that the author planned a special book on mathematical problems of mining - but this also was not done.

All three Czech editions are identical and in spite of a long time distance among the editions they had been printed with the same tape-setting.

f) Pavel Sam of Budisov

Regula De Tri  
 a každý wstoyim Scamtu ma položiti: fa: Ra,  
 b: ca: spolem 533 fl/ 10 gr/ a každý obzwlaffe  
 1 - 7 7 fl 2 3 gr / 2 ½ d. Xrytý 2 6 6 fl 10  
 gr. a každý obzwlaffe 533 fl. 10 gr. Seman,  
 nr 1333 fl/ 10 gr/ a každý obzwlaffe 133 fl/  
 10 gr. Wessčaný 6 6 6 fl / 10 gr/ a každý obzwlaffe  
 4 + fl/ 13 gr/ 2 ½ d.

Tak se konáwa První Traktát O Počtu  
 na Linách / wíce a rozličnější Exempla  
 při druhým Traktátu o Počtu na  
 Cyffrach nageds.



Druhý

365  
**Druhý Traktát**  
 této Knihy o rozličných Počtu  
 na Cyffrach / Rozličných a vžite  
 ných Regulích / na wsselstau Wincey m  
 tu / Wahny qiny / tere a Regulz De  
 Tri szamangj.

**N V M E R A T I O .**

**Aumerach.**

**N** Vmeratio, Co Numeracy nel  
 počítaný wš Agst w předestyn  
 Traktátu wo Počtu na Linách dost  
 ssyrně powědýno / proč hnd k následu.  
 ycm Stránkam a Specibus přistupým.

**A D D I T I O .**

**Summowáný.**

**S** Czý mnoho diwných a rozdl  
 ných počtůw do jedné Summy wneš  
 sti / týmes Slowěčkem A.

G

Sporás

He was the last author of this series. We know only, that he was a printer in Moravian Olomouc in years 1612/4-1621/3. He belonged to the protestants, his son Krystov emigrated to Wittemberg after 1621 and printed there anticatholic pamphlets and sent them to Bohemian Lands.

The original version of Sram's textbook had to be German and was edited at 1609, but up to now no copy was found. Also the only known copy of Czech editions (1615) lost the title page and unknown number of leaves at the end of the book. The bibliography of old Czech printings (Knihopis) edited at 1939 introduced this Sram's book under the name of Adam Ries. We do not know if it is really only a translation of some of the many versions of Ries's successful textbook of 1525 and how it is connected with the original German version of 1609.

Merely half of the book is devoted to elementary arithmetical operations (species) and special rules connected with them. Interesting is a new topic in this part of the textbook: the so called "form of registers" which contains instructions of sold-day book. The second part is devoted, like in other mentioned arithmetics books to the reckoning with numbers. But Sram introduced all species together theoretically and the examples and special rules only afterwards. Examples are then ordered more according to the used applications then to the mathematical contents.

4. If we shall conclude this 85 years' development of the first Czech practical arithmetics books, we see that the theoretical background was simple- it did not exceed the "algoritmus". The reason of the books was in examples, special rules, tables of units. All contents were depending on locality (money, weights, measures, prices, goods) and time, because all those units were still changing over the years. Therefore it was impossible to make only simple translations of foreign textbooks.

There are other problems connected with the study of those old textbooks in vernacular languages. We need comparative studies, not only of textbooks in one area and in one epoche, but besides structure one has to compare contents in its extension, used examples and their methods of solution and also used concrete numbers in different countries, not only European ones, and in different times. After that we will be perhaps able to prove the thesis of mediterranean influence on first steps of reckoning textbooks in vernacular languages in other countries of Europa. And more: The comparision would be made also with examples used in Egyptian papyrus or Mesopotamian cuneiform texts, because even there we should find not only similar problems but maybe also similar formulations of examples, and given with the same concrete numbers.

As concerns the further Czech development it is not typical for the other European countries. Time of Maxmilian and Rudolf II was over with Rudolf death (1612). Resistance of Czech Estates was defeated in the battle on the White Hill (1620) and the thirty years war between protestants and catolics began. It effected for Bohemian Lands the predomination of nontolerant influence of Spain Habsburgs and 1621 began with execution of Czech nobility, then with introduction of new loyal and mostly German aristocracy into Bohemian.Lands. For example the confiscations were put in care of Lichtensteins and from that time this genre had in Moravia more land than in their own county. Ferdinand II had given in 1627 three rules : (1) new organisation of country, (2) introduction of German language as the parallel official language, (3) The only choice for all protestant nobility was either conversion to catholicism or to emigrate. About 30% of nobility but also towns inhabitants and peasants -who were forbidden to do so - emigrated. Among them for example Jan Amos Comenius and other Moravian brethers.

The normal development of Czech culture, which we have seen only through the example of elementary mathematical textbooks was interrupted. Jesuits were used for recatholization, Germanization was used for centralization of Habsburgian sovereignty and not only Czech practical arithmetics, but also new mathematical and physical ideas originated in protestant countries were for a long time not introduced to university in spite of the evidence that they were familiar in Prague Jesuit circles. But this is another chapter of science development in Bohemian Lands.