

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

47 LAFAYETTE PLACE, NEW YORK.

SUBSCRIPTIONS.—United States and Canada..... \$3.50 a year.

Great Britain and Europe..... 4.50 a year.

Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and twenty copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

VOL. XV.

NEW YORK, APRIL 11, 1890.

No. 375.

CONTENTS:

A SHORTHAND TYPE-WRITER.....	225	HEALTH MATTERS.
SALADS.....	225	The Influence of Cold on Pneumonic Infection.....
FOOD AND FOOD ADULTERANTS		236
Edgar Richards	226	A Long Fall.....
NOTES AND NEWS.....	230	Tight Collars and Vision.....
HAS EVERY ONE A NATURAL CALLING?		236
ING?.....	232	The Treatment of Phthisis by Carbonic Acid.....
HINDU ARITHMETIC	234	236
		BOOK-REVIEWS.
		Numbers Universalized.....
		236
		AMONG THE PUBLISHERS.....
		236

HAS EVERY ONE A NATURAL CALLING?¹

It is not a rare occurrence to hear of a person that he has "missed his calling." People mean that his natural faculties and endowments are better fitted for other kinds of work than the one in which he is engaged. Here, then, we meet with the presumption that the person in question is especially well qualified for a particular occupation. Upon this presumption is based the meaning of the word "calling." He who is called to perform a certain kind of work or to fill an office is given credit for the qualifications it requires.

But let me ask, is there any such thing as a natural calling for every one? that is to say, is there in man a combination of faculties which qualifies him for a certain kind of activity, and for no other? Is he predestined, if I may use the term, to his calling, by the peculiar mixture of natural gifts he possesses?

The Germans are apt to answer this affirmatively. They maintain that every one is particularly well equipped by Mother Nature for one kind of activity, but that it is difficult to discover for which one, and that many persons fail in discovering it, choosing a field of occupation for which Nature has not intended them. In many cases their chosen profession or occupation is not the right one, which is illustrated in numerous cases. In truth, the fact that many pursue a calling in which they are not successful seems to indicate the strength of the argument. Yea, "to miss

¹ Paper read before the Anthropological Society in Washington, March 18, based on Professor Rohrbach's treatise on this question, by L. R. K.

one's calling" was a proverb long before Bismarck characterized the journalists as men who had missed theirs.

In America we are apt to answer the question in the negative, and just as emphatically. The American will grant only in rare cases that a man may have a natural calling. Generally it is asserted that every one has the calling to earn his livelihood; and, as to the different kinds of human activity, our reverence for the self-made man prompts us to believe that every one is capable of doing any thing, provided he takes hold of it with pleasure and good-will.

Here, then, we have two opposite opinions, — on the one side, the German idea, that every one is equipped, that is, called for, a special kind of work, which idea has been developed in the most ideal manner, and defended by the ablest arguments; on the other side, the American idea, that every one may be or is prepared for or called to many, if not to all kinds of work. Which of the two ideas is correct, — either or neither of them? If neither, which one comes nearer the truth?

In order to answer these queries understandingly, it will be well to inquire into the origin of the two diametrically opposed ideas.

The Germans are an old nation, with a history and national culture of more than a thousand years. When first appearing upon the historic stage, they were divided into ranks, — in high and low nobility, free-born retainers, and serfs or servants, among whom were again distinguished body-servants and servants of the estate. When through war and strife, particularly in consequence of hostile invasions, it was found necessary for many to leave their isolated abodes, crowd together in cities, and live securely side by side behind ramparts, palisades, and town-walls, the social status of former times could not be retained. It was hard to give up privileges, for he who is in possession shuns the change; and it is proven in history that it is easier to yield an inborn right than to relinquish a privilege (a private right). But necessity knows no laws. The privileges of the free-born were disregarded in towns where all had to live together, side by side, and the will of the majority became law. The cities were populated, and soon became the very backbone of resistance to oppression and transgression of princes and nobles. In due course of time, inequalities vanished, and the citizens acquired equal rights, though not until after hard struggle and civil strife.

Even noblemen found it necessary to resort to some occupation where every one was obliged to make a living; and so we see families of great repute and noble name become merchants, armorers, etc. And just as among the Romans some trades were despised, we see in the cities of Germany that some occupations became honored, others despised and detested. The patriarchal government of those times soon regulated every thing, even the number of masters in each trade. Guilds sprang into existence, originally for the protection of their members, afterward for the exclusion of outsiders. Soon the guilds were sharply defined, and formed communities within the community. Even within the narrow confines of a guild numerous grades and subdivisions were established. There were tailor, carpenter, weaver, cobbler guilds, etc. Joiners and carpenters were not permitted to confound each other's work, any more than could nail-makers and blacksmiths, bricklayers and stonemasons. The cobbler who made men's boots and shoes was prohibited from making ladies' shoes: that was meddling with some one else's trade.

These guilds have a history of eight hundred years. Their pernicious influence upon culture and civilization is a matter of history, and need not be stated here; but it must be mentioned that they fostered the idea of seclusion and separation. They gave rise to the idea of a predestined calling for every one; and this idea became so predominant, that the accident of birth decided not only nationality and religion, but also the calling of the child; and to a limited extent this is still the case in our times.

In this country we ridicule the idea. Here the new-born child is not placed face to face with such an idea. He breathes the free air of a country which enjoys political and social liberty, as well as liberty of trade. In Germany the child seems to inherit the germ of the idea that his destiny is pre-conceived; and he inhales, figuratively speaking, an atmosphere which is fitted to develop this germ. A child of German parentage in America may inherit

the same tendency, but this tendency dies away under the influence of the unfavorable circumstances surrounding the child. Every thing here is opposed to it: the currents of American thought admit of no such presumption. The inherited tendency finds no nourishment whatever, and dies out.

That the guilds should have fostered the idea of predestination is evident. That the son should adopt the business of the father, in which he had grown up, the peculiarities of which he had known from early childhood, was something so self-evident, that the custom became an established rule.

Just consider this: the father's shop was ready for him to step into, material and goods were stored up, resources for this particular business and a market were found, custom was secured; in short, the father had warmed the nest so nicely, that the son would have been a fool to fly away into insecure circumstances to fight the hard battle for subsistence.

To all this came another powerful motive: liberty of trade, and the right to settle in any part of the country, are of very recent origin in Germany. Not only the guilds proved obstacles to the freest development of the nation's resources, but also the great number of independent and often antagonistic states and principalities and their governments. Though, through the peace at Muenster and Osnabrück at the close of the thirty years' war, two hundred of these petty states were wiped out of existence, there still remained more than three hundred and fifty of them up to the beginning of the nineteenth century; and every little fatherland had its own government and boundary posts. Not even the right to change one's domicile within these posts was readily granted. It was considered rank heresy, and an outrage upon time-honored custom, to speak of leaving; it was high treason to leave; and so the son staid where his cradle had stood. Of course, he spent a few years in travelling as journeyman, plying his trade under renowned masters; but soon he returned to the old nest.

This exclusiveness was particularly strict within the walls of the cities. Since their inhabitants had, by natural increase, filled the towns to overflowing, the city government prohibited outsiders from settling in town. The elders of the guild determined upon a certain number of masters who could ply their trade; no others were permitted to open a shop, lest competition might play havoc with their bread and butter. Even the sons of masters had to wait for the death of their fathers before they could start in business or become masters. As the number of inhabitants was literally limited by town-walls, so was the number of tradesmen by harsh, arbitrary rules. No wonder that hundreds, thousands, and hundred-thousands packed up and left, never to return.

To our own century it was reserved to remove the tyranny of guilds in Germany; and liberty of trade and settlement has only been secured by law during the last fifty years. This could never have happened if the cities had not first broken their choking neck-ring. — the town-walls, — and levelled their ramparts. It was a sequence of the marvellous change in warfare inaugurated by Napoleon I. Thus we see a beneficial sequence following the terrific influence of war. Such imposing armies as were massed together (1,300,000 soldiers went to Russia under command of Napoleon) made a mockery of town-walls and ramparts, built and thrown up before gunpowder was invented; and they were soon torn down and levelled by the citizens. After the restless little man Napoleon was safely stowed away as a prisoner on the Island of St. Helena, a time of peace of more than fifty years followed; and, lo! all the many buds broke open, and out of musty streets, and from behind mouldy town-walls, sprang an exuberantly blooming life in every domain of human exertion. Now additions from outside were welcomed in town. The cities swelled. The band that had checked their growth was torn asunder.

However, a state of things such as I have indicated had existed for more than eight hundred years, and had developed a certain mode of thinking and acting; had ripened certain deep-rooted prejudices; had imprinted upon life in Germany an almost indelible stamp; in fact, it had nurtured the idea of a natural calling for every one; and it need not be wondered at that there is still a strong current of thought in Germany which directs, or misdirects, the destiny and future of many a child.

Now turn to the Union. Here the people began, about two hundred years ago, where the Germans stand now. Here we never had town-walls, never any guilds, no limitation as to number and grade of practitioners of trade. Here we had no hostile neighboring nations lurking about to invade our territory and take us unawares. Free and unmolested, the people built their houses, towns, and cities, — built them upon the virgin soil under God's free heavens, without fear of sieges and scaling-ladders. Every one was permitted to come, and he was welcome to build; and if he thought he could earn his daily bread, he could do so without fearing any arbitrary limitations by guild regulations. Competition has ever been absolutely free in this country. The liberty of trade, like political liberty, has its own regulator. Trades and industries are governed by the steady force of the law of supply and demand, and the sleepless instinct of gain prompts us to heed that law.

The American farmer-boys of "ye olden time" (and they were greatly in the majority) were raised in a most excellent school, that of necessity. The great distances between the farm and the centres of trade made them lend a hand at almost every trade. They learned to repair stoes, wagons, and implements, to shoe horses, ply the carpenter's and joiner's trade, etc. They were not exclusively farmers. The idea that a man is predestined for one kind of labor, and for no other, never occurred to them.

The peculiarly advantageous circumstances of the New World for gaining wealth; constant immigration of skilled laborers from all civilized nations; a restlessness, which became permanent, caused by a constant westward movement of the people; the hope to enrich one's self still more quickly elsewhere, — these motives stirred all the powers of the nation into a mad whirl. A constant shoving and pressing, an unceasing roaming about and seeking luck, became the ruling passion of the people. The idea of taking root in a community rarely prompts any one here. Is he not the citizen of a country the extent of which is so great that it takes him six months to cross it on foot from east to west? Compare with such magnitude some small German principalities through which one could pass on foot conveniently in a day.

Now, when the American does not like one place, or if he fails to catch luck or to secure a fortune in one occupation, he simply turns to another; and so he changes readily from professions to trades or to farming, as circumstances seem to favor the one or the other. Since the people have never known town-walls or guilds, they do not entertain the idea that a man should devote his life to one thing exclusively. It is not at all astonishing to see a man shift from book-keeping to cigar-making, from farming to practising law or medicine, from working in a machine shop to doing this glorious country inestimable service as policeman or legislator.

We must not for a moment entertain the idea that this is conducive to great mischief. It is not: I rather think this freedom more beneficial than the humiliating bondage to which, according to the German usage, a man is condemned who has "missed his calling," and has to abide by the consequences of his folly. Let me repeat, liberty always has a regulator in itself. Free choice of occupation follows laws which are as unerring as the law of gravitation. No guild regulation could ever compete with them in effectiveness. Nature's law of the "survival of the fittest," though terribly cruel, is very effective.

And now we come back to our question, Is every person predestined for a calling? Approach the question regardless of preconceived notions, and you will have to consider that every one has his own peculiar face, his own form; each of his limbs or hands is peculiarly shaped, and cannot be duplicated by that of any other human being. His senses and faculties are in their combination so wonderfully and peculiarly arranged, that there may, perhaps, be found a similarity, but never an exact duplicate. This proves, if any thing, that no two men can be exactly alike in faculties, qualifications, tendencies, and accomplishments, so as to feel at any time, and under all circumstances, exactly the same impulse for action. Every one will move in a direction differing from that of all other men. Evidently, then, the peculiar mixture of which every individual consists tends toward confirming the belief that every one has a calling; that is, every person

must be specially well fitted for one kind of work, and for no other as well.

That would seem to settle the question, but it does so only apparently. The child is a "soft and yielding being." Plant-like, he accommodates himself to influences which play upon him. His aptitudes grow exuberantly on the one side, and become crippled on the other, as friendly or hostile influences prevail. A symmetrically shaped plant will become twisted and distorted if placed against a wall. It depends upon the treatment of the gardener, whether a tree will spend its energy in producing leaves or fruit. A boy six years old may have a talent for art, his sense of form and color may be very pronounced; yet after five years he may be found to have apparently lost that faculty, and developed in a direction which makes the observer prophesy that the boy will become a great lawyer. And, again, after some years he may be found to have developed great skill in manual occupation, having apparently pressed into the background his liking of art and literature.

These are no hypothetical cases. Every observant educator will have come to the conclusion ere this, that it is utterly unfruitful and perilous to fore-ordain a pupil's future. This being the case, it seems to me wise to follow the advice of eminent men; to wit, develop harmoniously all the talents that manifest themselves in the child, and leave the choice of occupation or calling to the developed and ripe judgment of the youth. Do not make this choice irrevocable. Give every one the greatest possible freedom for changing his profession, or occupation, or calling (or give it whatever name you will), if he comes to the conclusion that he missed it in his first choice. A human being who has had the chance and manifold opportunities for testing his natural gifts, and is permitted to exert himself in many directions, will certainly find his natural calling, and achieve great success. Let there be no arbitrary rules, no guild regulations, but let us maintain that liberty of action which has made this nation what it is, the greatest, noblest, most talented, most energetic, most successful, and therefore happiest, nation on the face of the earth.

HINDU ARITHMETIC.

EUROPEANS who have resided in India have frequently expressed astonishment at the rapidity with which arithmetical calculations are mentally made by very small Indian boys. Some account, therefore, of the Indian method of teaching arithmetic, which is believed to be superior to the English methods, is given by Frederick Pincott, M.R.A.S., in the April number of *Knowledge*, and will probably be interesting to our readers.

The arithmetical system of Europe was revolutionized by India when the so-called Arabic figures which we daily use were borrowed by Arab traders to the Malabar coast, and by them introduced into Europe. It was Indian intelligence which devised the method of changing the values of the numeral symbols according to their positions. This ingenious conception rapidly superseded the older methods, and gave enormously increased facility to arithmetical computations as compared with the Greek and Roman and the older Arabic methods.

In order to explain the present Indian system of arithmetic, it is necessary to premise that the *Pāndhes*, or schoolmasters, employ a number of terms unknown to English teachers. These terms have been invented for the purpose of facilitating calculation, and the astonishing results achieved cannot be understood without comprehending the terms employed. The strangeness of the names of the figures and fractions arrests the attention of every student of Hindi. Few attempt to master the fractions; and there are some who, after many years' residence in India, cannot repeat even the numbers from one to a hundred.

Indians use monosyllables similar to ours, from 1 to 10; but from that point the words are built on the model of "1 and 10," "2 and 10," "3 and 10," etc.,¹ up to "8 and 10;" but the word for 19 means "minus 20." After 20 the same method is continued; "21" being impossible, the form is invariably "1 and

¹ This is also the original meaning of the English words "eleven," "twelve," etc., up to "nineteen."

20," "2 and 20," up to "minus 30," "30," "1 and 30," and so on. This method of nomenclature goes back to remote antiquity, for the old Sanscrit language presents the same peculiarity.¹ The object of this nomenclature is to facilitate computation; for, in reckoning, the mind has to deal with the even tens, the simplest of all figures to multiply. Thus the question, "9 times 19," is not a simple one to an English child; but the Indian boy would be asked, "9 minus-twenties." In an instant he knows that he has only to deduct 9 minus quantities from 9 twenties, and the answer 171 comes before the English boy has fully realized the question. The formidable difficulty of the 9 is thus completely got rid of by a mere improvement in nomenclature.

Another advantage that the Indian boy has is the use of short, mostly monosyllabic, terms for every ascent in the decimal scale; thus such lumbering expressions as "one hundred thousand" are unknown to him, the simple word *lākh* conveying the idea fully to his mind. So, also, "one thousand millions" is *arb*; "one hundred thousand millions" is *kharb*; and so on. The advantages of this terseness must be at once apparent.

It is, however, with respect to fractional numbers that the advantage of the Indian system of nomenclature becomes most conspicuous, when once understood. They employ a large number of terms, which are given below.²

These terms are *prefixed* when used in combination with whole numbers, the object being to present the special modification to the mind before the number itself is named. Complicated as this nomenclature appears at first sight, its difficulties disappear when brought to the test of practice. It is the outcome of centuries of practical experience, and the thoughtful application of means to an end. It will be sufficient to illustrate the use of these words, and the extraordinary arithmetical facilities they afford, if the use of *paune* is explained, that is, $\frac{3}{4}$, that being the fraction which the English child has most trouble with. The Indian boy knows no such expression as "two and three-quarters;" in fact, the term "three-quarters" in combination with whole numbers has no existence in his language. His teacher resorts to the same device as has been explained when speaking of the figure 9: he employs a term which implies "minus." By this process $2\frac{3}{4}$ becomes *paune tin*, that is, "minus 3," or "a quarter less 3;" and in the same way $3\frac{3}{4}$ is *paune chār*, that is, "minus 4;" and so on.

Precisely the same plan is adopted with reference to the term *sawā*, which implies "one-quarter more;" thus $3\frac{1}{4}$ is *sawā tin* = "plus 3;" $4\frac{1}{4}$ is *sawā chār* = "plus 4;" etc. It will now be seen that the *whole* numbers form centres of triplets, having a minus modification on one side, and a plus modification on the other. This peculiar nomenclature will be clearly apprehended by the following arrangement:—

$2\frac{3}{4}$ paune-tin -3	$3\frac{3}{4}$ paune-chār -4	$4\frac{3}{4}$ paune-pānch -5
$\frac{3}{4}$ tin 3	$\frac{3}{4}$ chār 4	$\frac{3}{4}$ pānch 5
$3\frac{3}{4}$ sawā-tin +3	$4\frac{3}{4}$ sawā-chār +4	$5\frac{3}{4}$ sawā-pānch +5

In multiplying these fractions, therefore, the Indian boy has to deal with only the minus and plus quantities. A simple instance will illustrate this. "7 times $99\frac{3}{4}$ " would be a puzzle to an English child, both on account of its lumbering phraseology, and the defective arithmetical process he is taught to employ. The Indian boy would be asked, "*Sāt paune-sau*?"—three words meaning "seven minus-hundreds?" The very form of the question tells him that he has only to deduct 7 quarters from 700, and he instantly answers 698 $\frac{1}{4}$. Equal facility is found with any similar question, such as "5 times $14\frac{3}{4}$?" The Indian boy is asked, "*Pānch paune-pandrah*?" i.e., "5 minus-fifteens?" As the words are uttered, he knows that he has only to deduct 5 quarters from 5 fifteens; and he answers at once, "*Paune chau-hattrah*," i.e., "a quarter less four and-seventy" ($73\frac{3}{4}$).

So much for the machinery with which the Indian boy works. The more it is understood, the more it will be appreciated. It is undoubtedly strange to our preconceptions; but it would be a

¹ In the ancient language there was also an optional form in conformity with the English method.

² *Pā.o* = $\frac{1}{4}$; *ādh* = $\frac{1}{2}$; *paun* = $\frac{3}{4}$; *paune* = $-\frac{1}{4}$ ($\frac{1}{4}$ less than any number to which it is prefixed); *sawā* = $\frac{1}{4}$ ($\frac{1}{4}$ more than any number to which it is prefixed); *sārhe* = $+\frac{1}{2}$ ($\frac{1}{2}$ more than any number to which it is prefixed); *derh* = $\frac{1}{2}$ (a number + half itself); *pawannā* = $\frac{1}{4}$; *arhāi* = $\frac{3}{4}$ (twice and a half times any number); *hūnthā* = $\frac{3}{4}$; *dhaunchā* = $\frac{1}{2}$; *pahūnchā* = $\frac{5}{4}$.