

ULISSE ALDROVANDI OFFENDED THE NETHERLANDS BY ECLIPSING VOLCHER COITER

The naturalist Ulisse Aldrovandi has been a big sly profiteer, that is, an avid pincher of scientific researches done by someone else. We are provided with a patently clear example of this by the vicissitude of Volcher Coiter who doesn't absolutely appear in Aldrovandi's three treatises of Ornithology, despite Coiter represented the milestone in the daily survey on development of chicken's embryo, carried out on Aldrovandi's stimulation - so the latter becoming his godfather - and being Coiter his disciple in Bologna University. The results of the search were published by Aldrovandi in the 2nd volume of his Ornithology (1600) from page 216 up to page 219 of the 14th book devoted to the chicken, and precisely in the chapter entitled LUSTFULNESS - MATING - EGGS LAYING - INCUBATION - GENERATION - HATCHING, where he doesn't allow doubts about the maker: he himself, absolutely not the unknown Coiter. Incidentally: neither Conrad Gessner appears in Aldrovandi's three treatises of Ornithology, intentionally eclipsed under the pseudonym of Ornithologist (because of the Inquisition, since all the books of Gessner had been set on the Index), nevertheless these 3 volumes of the Bolognese naturalist are just a dull download of the valuable Gessner's Ornithology contained in his *Historia animalium III* (1555).

Even though I graduated in medicine at Pavia's University in 1967, I confess that never heard somebody speaking about Volcher Coiter, nor during the lectures of history of medicine. I knew him only in 2005, but through side streets traced by Sandra Tugnoli, when I was translating from Latin the text of Aldrovandi concerning the development of hen's chick in the egg.

The *Enciclopedia De Agostini* (1995) brings honour to Coiter in quoting his biography, the same happens for *Dizionario biografico della storia della medicina e delle scienze naturali* (Franco Maria Ricci, 1985) and for *Enciclopedia biografica universale* (Treccani, 2007). All these sources put in evidence that the researches of Coiter represented a decisive moment in the development of Renaissance anatomy. Coiter studied in a systematic way the structure of the skeleton of several vertebrates and, by vivisection, he has been able to describe the shape and the functions of the heart of snakes, frogs, fishes and cats, discovering among other things how the hearts severed from the rest of the body go on with beating. Furthermore he studied the anatomy and the skeletal structure of the birds, but not only, having been the first one to have described and represented the skeleton of the human fetus in various stages of development.

There is a work of Coiter unavailable in the web but of great interest for those people involved with the chicken: *De ovorum gallinaceorum generationis primo exordio progressusque, et pulli gallinacei creationis ordine* contained in *Externarum et internarum principalium humani corporis partium tabulae* (Nürnberg 1573).

That this study of embryology occurred in Bologna on 1564 must be substantially attributed to Coiter is guarantor Sandra Tugnoli (University in Bologna), excellent and impartial Aldrovandi's scholar.

In embryology Coiter took up and improved the observations of Aristotle, monitoring day by day the development of hen's embryo in the egg. As Sandra Tugnoli affirms at page 10 of her OBSERVATION OF EXTRAORDINARY THINGS The *De observatione foetus in ovis* (1564) of Ulisse Aldrovandi (Bologna, 2000) a propos of Ulisse, the scientific merit, not that of promoter, goes to Coiter: "In truth, as it comes out from documents, the matter looks as follows. Although in the unpublished work [*De observatione foetus in ovis*] and in the *Ornithologia* he doesn't mention any collaborator, Aldrovandi didn't make alone the investigation under discussion, on the contrary together with a team of students, within which probably the role of anatomist was mainly performed by Volcher Coiter, but promoter of the investigation was Aldrovandi, his teacher."

But Aldrovandi not even deigned in quoting Coiter about the research on chicken embryo we find in his *Ornithologia*. As a true first lady, Ulisse makes his debut at page 216 affirming: "ex ovis duobus, et viginti, quae Gallina incubabat, quotidie unum cum maxima diligentia, ac curiositate secui - each day, with the greatest care and curiosity, I dissected one of twenty-two eggs which a hen was incubating". No trace of Coiter.

That Coiter carried out this embryological investigation should correspond to the truth, if we want to believe what Howard Adelman was affirming in 1972 in his DISCORSO DEL VINCITORE DEL PREMIO INTERNAZIONALE GALILEO GALILEI DEI ROTARY ITALIANI, when just in Pisa the famous American

biologist (born in Buffalo NY in 1898, who had the luck of having in his hands *Externarum et internarum principalium humani corporis partium tabulae*) affirmed what follows, not sparing with undeserved praises to Aldrovandi:

« I have been interested in Italian science and in embryology at the same time. More than forty years ago, in truth, I started to study the investigations done by three great men, Ulisse Aldrovandi, Girolamo Fabrizi d'Acquapendente and Volcher Coiter, who after Aristotle have been the first ones in examining with their own eyes the development of the chick in the egg. Of these men, as you see, two were Italian, and one of them was teacher of the third one, the Dutch Volcher Coiter, who in 1573 published in Nüurnberg in his *Externarum et internarum principalium humani corporis partium tabulae* the first observations day by day of the development of the chick. Teacher of Coiter was, I say again, Ulisse Aldrovandi, universal genius, who pushed him to start his searches on the chick. Coiter himself recognizes the debt. "In Bologna in May 1564", he tells us: "... stimulated by Doctor Ulisse Aldrovandi (very excellent teacher of ordinary philosophy, distinguished man in the knowledge of the various sciences and arts and particularly of natural philosophy, my promoter and teacher always very honourable) and encouraged by other professors and researchers, I had chosen two broody hens, that is, hens ready for brooding. Under each of them I placed twenty-three eggs, and, being assistants those men, I opened one egg every day so that we were setting out above all these two points, that is, the origin of the veins and what thing is first taking shape in the animal."

A clearer testimony is not necessary in order to confirm that the stimulus for the reopening of direct embryological observations has been of Italian origin. And it could be that the observations of Aldrovandi, although published only in 1600, in the second volume of his *Ornithologia*, were done before those of Coiter. »

There are two snags to be solved. The easier is that concerning the date of the search of Aldrovandi. According to the study of Sandra Tugnoli it goes back to 1564 and the date fully agrees with that quoted by Coiter for his own search. Aldrovandi, because of his commitments (mainly of first lady) didn't test himself at all in studying alone the embryo, neither before nor after 1564.

The second snag could be solved if we had available the Latin text of Coiter. As by experience I am aware, it is easy to unintentionally distort the meaning of a text when translating it. The fact is that, according to Adelman, Coiter affirms to have put to brood the eggs under two broody hens and that under each of them he put 23 eggs (not 22 as Aldrovandi, he too under only one hen!). Maybe that Coiter forearmed himself against a non-hatching, whose percentage is sometimes high, and therefore he acquired 46 eggs, but only 21 of them with a regular development of the embryo would have been useful. Or Coiter had put to brood 11 eggs under a broody hen and 12 under the other one. This hypothesis is, in my opinion, the more truthful, being that, if they were 2 broody large hens brooding very small eggs laid by dwarf hens, also in this case 23 small eggs would have been too much for only one large hen.

Marcello Malpighi (1628-1694) is supporting us when quoting the material source of his two jobs on chicken embryo, *De formatione pulli in ovo* (February 1st 1672) and *Appendix de ovo incubato* (October 1672) carried out in Bologna. For the first experiment Malpighi affirms: "In hen's eggs brooded either by a turkey hen or a home hen at the height of summer [1671] I was observing the following changes;[...] - In incubatis autem Gallinae ovis sub Indica vel nostrate gallina, summo vigente aestu, tales attingebam mutationes;[...]". Then Malpighi had available a hen and a turkey hen who had begun to brood at the same time. For the second experiment: "In an egg brooded by a turkey hen in the last month of July [1672],[...] - In Ovo, elapso Julii mense ab Indica gallina incubato,[...]". And also in this case we don't have anything to object, since turkey hens are easily housing under themselves 25-30 usual hen eggs, that is, 5.5 cm in length.

But to humiliate the naturalistic talent of Aldrovandi, already Hippocrates had thought around 2 millennia before. Sandra Tugnoli at page 21 of her "Osservazione di cose straordinarie – Il *De observatione foetus in ovis* (1564) di Ulisse Aldrovandi" quotes an excerpt from *De natura pueri* of Hippocrates: "Take twenty eggs or more, and put them to brood under two hens or more;[...]", which at page 52 of the translation from Greek done in 1546 by Janus Cornarius sounds as follows: "Etenim si quis ova viginti aut plura, quo pulli ex ipsis excudantur, gallinis duabus aut pluribus subijcere velit,[...]". If we want to be fussy, in case we are suspecting a wrong English and Latin translation, here

is the Greek text of Hippocrates translated in French too: [29] Εἰ γὰρ τις ἐθέλει ὠὰ εἴκοσιν ἢ πλείονα, ὄκως ἐκλεπίσῃται, ὑποθεῖναι ἀλεκτορίσιν εἴτε δυσὶν εἴτε πλείοσι... - Prenez vingt oeufs, ou plus, et donnez-les à couvrir à deux poules ou à plusieurs... (Hippocrate *Oeuvres complètes* vol. 7 par Émile Littré, Paris 1851)

Obviously Coiter was not unaware of what suggested by Hippocrates about the number of eggs and hens. We make beforehand this interpolation because, as soon you will know, luckily we acquired the text of Coiter, who at page 36 of *Externarum et internarum principalium humani corporis partium tabulae* is quoting a translation practically identical to that of Cornarius: Si quis ova viginti, aut plura, quo pulli ex ipsis excudantur gallinis duabus, vel pluribus subijcere velit.

On the contrary Aldrovandi, even though repeatedly quoting Hippocrates, since he dissented from the truthful Hippocratic theory according to which the embryo takes life in the yolk, he doesn't report at all his suggestion about the number of eggs and hens. Such a suggestion is absent both in *Ornithologia II* and in manuscript 75 (II) *De observatione foetus in ovis* (1564) transcribed and translated by Nicola De Bellis and appearing as precious appendix of the job of Sandra Tugnoli. The beautiful is that at page 223 of *Ornithologia II* at the end of the report around the number of eggs to be entrusted to a broody hen (in which we find Florentinus, Varro, Pliny and Columella and a number of eggs ranging between a maximum of 25 and a minimum of 15), Aldrovandi reports an information which is nearly corresponding to the truth: "But our women – the Bolognese women – almost always give the broody-hens no more than 17 or 19 eggs for incubation. - Sed nostrae mulieres semper fere non ultra septemdecim, vel novemdecim glorientibus incubanda exhibent." But he snubs them, entrusting on the contrary 22 eggs, but only in order to try to mystify somehow the true source of his data, that is Coiter, who used 23 eggs and 2 hens.

But Filippo Capponi in his *Ornithologia Latina* (1979), as good ornithologist as well as excellent Latinist, without knowing, snubs Aldrovandi. In fact, after having reported the number of eggs to put under a broody hen as recommended by Varro, Pliny and Columella, Capponi affirms: "Nella pollicoltura rurale di oggi, di norma, si consiglia per la cova 9-11 uova (peso 55-60 grammi) e anche 12-15. - In the rural chicken-farming of today, as a rule, for the brooding they recommend 9-11 eggs (weight 55-60 grams) and also 12-15." Which corresponds to the dictates of Hippocrates as well as to daily experience of XXI century.

As many judicious and well-chosen are seeming me the suggestions of a contemporary of Aldrovandi, Olivier de Serres (1539-1619), who, living in Villeneuve-de-Berg (Ardèche) at the same latitude of Bologna (44th parallel), in his *Le théâtre d'agriculture et mesnage des champs* (1600) so expresses himself: "Then in such an early season [January and February] it will be enough to give a hen a dozen of eggs: in March someone more: and finally in April, and from then on, so many as the hen will succeed in embracing and covering: to her brooding the season will be of great help, since it goes warming up day by day. - Parquoi en telle primeraine saison, ce sera assés de donner à une poule une douzaine d'oeufs: en Mars, quelque peu davantage: et finalement en Avril, et de là en hors, tant que la poule en pourra embrasser et couvrir: à la couvee de laquelle aidera beaucoup le temps, s'eschauffant de jour à autre."

Whence we can infer that in Hippocrates' time (460 - c. 370 BC) the hens were brooding a number of eggs like their colleagues of XVI and XXI century. It is biologically foregone that in 1564 the hens of Aldrovandi had an incubating capacity identical to that one of broody hens both of Hippocrates and ours. This implicates a lack of scientific precision by Aldrovandi, contrarily to what shown by Hippocrates, as well as by Marcello Malpighi. I think that Coiter would go out undamaged if we had available his Latin text.

And the Latin text of Coiter is in our hands! Thanks to the refined and excellent inquiring temper of Elly Vogelaar, on Wednesday May 6th 2009 I receive from Glasgow University Library a good reproduction of *De ovorum gallinaceorum generationis* contained in *Externarum et internarum principalium humani corporis partium tabulae* (Nürnberg 1573). And now a new row begins, which requires a well-deserved cerebral compensatory break.

Have you made the neurons to rest? Yes, well. We will see if you will succeed in arriving at the end of what I am on the point of feeding you.

The problem we will face is not only of biological type. In fact every one of us, even when only a little experienced in breeding chickens, would be able to affirm that a dozen of eggs for each broody hen is a suitable number, especially if the season is not cold, and Coiter started the eggs brooding in May of 1564. But the experience which is now required is something else, and not within everybody's reach: to know the Latin, and to know it rather well, in order to translate in a correct way a passage of few but important words. Let's see what Coiter wrote.

Equidem anno 1564 mense Mayo ... instigante me Ulysse Aldruando ... mandavi duas gallinas glocientes, sive ad incubationem proclives seligi, earumque singulis 23 ova subijci: atque istis comitantibus, singulis diebus unum ... aperui. - We accept *seligi* instead of the correct *selegi* only according to the Latin dictionary NOMEN (Paravia, Torino, 2002).

In truth, in the month of May of the year 1564 ... on instigation of Ulisse Aldrovandi ... I entrusted two broody hens with the task, that is, I chose two hens prone to brooding. Stop. Now comes the best. We will adapt the Latin text to both syntax and biology.

The translation of the key point - earumque singulis 23 ova subijci - could be twofold. In both cases Coiter shows himself a good chickens breeder and he is unharmed.

FIRST VERSION: and I placed underneath everyone of them THE 23 eggs - earumque singulis 23 ova subijci (virgin Latin text).

SECOND VERSION: and I placed underneath everyone of them their 23 eggs - earumque 23 ova singulis subijci - (transposed Latin text).

The Latin, unlike the Greek, doesn't possess the definite article and neither the indefinite one. If we remove from the first version the article "the", then the 23 eggs instead of being distributed among two broody hens they become $23+23=46$, then, removed the definite article, Coiter would affirm: "and I placed underneath everyone of them 23 eggs".

In spite of this, in my opinion *earum* (their) must be understood as possessive with determinative value, being the plural genitive of the third person feminine personal pronoun (*ea*) with determinative value. Thence it results that *earum* (...) *ova* are "their eggs". The adjective *singulis* - to everyone - is referred to *duas gallinas glocientes*, and since most likely they didn't brood in the same nest (as on the contrary often happened me to see), then Coiter shared out the 23 eggs among the two broody hens, probably 11 to one and 12 to the other. And a hen becomes broody when she laid, on average, 7 until 12 eggs to the utmost.

Thence the original English translation of Adelman "Under each of them I had placed twenty-three eggs"(Annals of Medical History N.S. 5 (1933) page 444), in my opinion is wrong and entails for Coiter the same superficiality of Aldrovandi, making them both transgressors of the advices of Hippocrates, nevertheless Aldrovandi couldn't care less. If the translation of Adelman were exact, then the Latin of Coiter should be slightly but substantially different. In fact, as already I said, *singuli* - each - is an adjective mainly used in the plural (let's remember the famous expression *in singulos dies*, day by day), then if Adelman was right the text of Coiter should sound this way: **EISQUE SINGULIS 23 OVA SUBIJCI**, where the adjective *singulis* is referred to the pronoun *eis*, to them.

On July 16th 2009 the Teacher Graziella Bassi, teaching Latin at Leon Battista Alberti secondary school with an emphasis on sciences (in Valenza, AL, Italy), agrees with me and sides with me instead of Adelman, obviously because of pure Latin's syntactic reasons, luckily fully agreeing with biological ones. There is no two without three. Also the Teacher Roberto Ricciardi of Alessandria, teacher of classical subjects, is agreeing with us.

This whole diatribe has been able to titillate Fernando Civardi, who is not only an electronic amanuensis: on May 7th 2009, early in the morning, before the dawn, he measured the eggs of layers bought in the supermarket, he did the due calculations and showed me the dimension as should be of a nest with 23 eggs of a large hen brooded by a large hen too.

a) Hypothesizing that the plain surface occupied by an egg can be amenable to that of a rectangle with its same length and width, it is possible to easily go back to the area occupied by a certain number of eggs having the aforesaid characteristics.

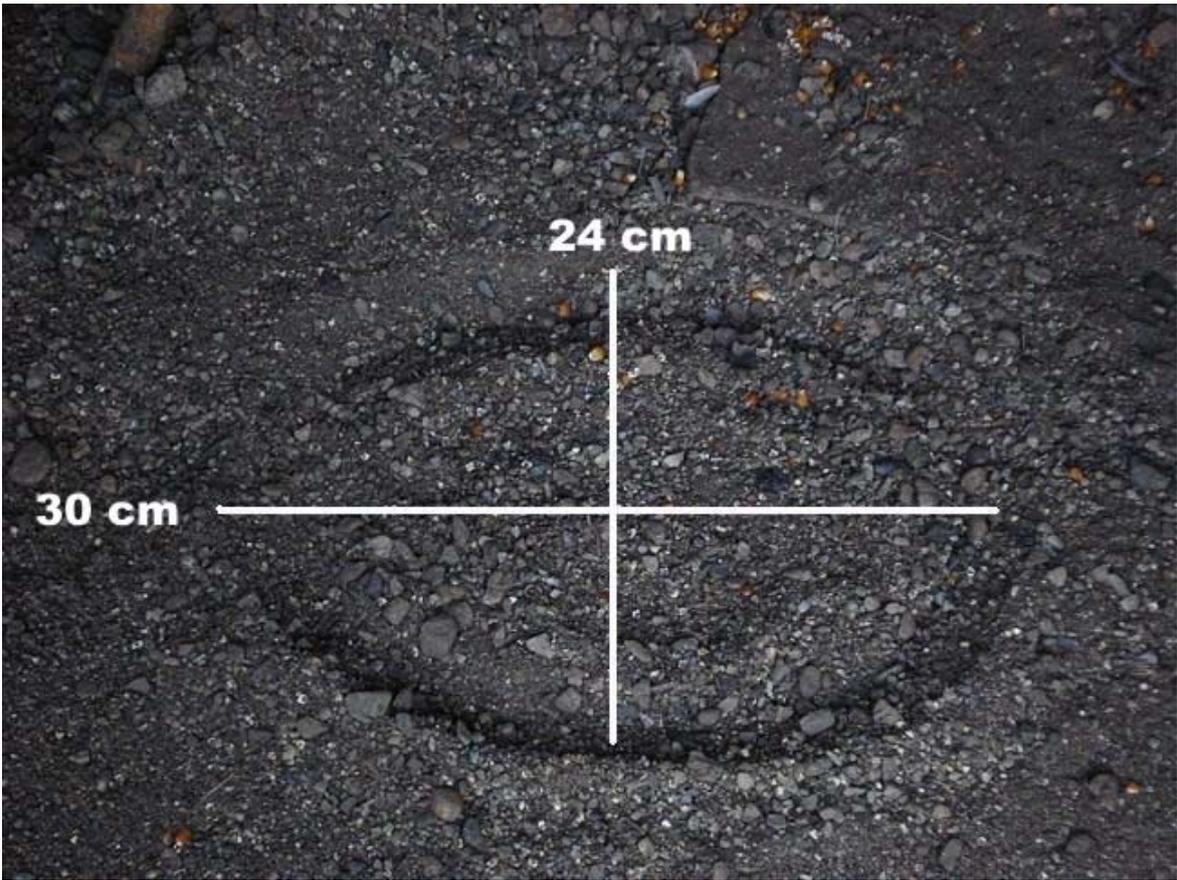
- b) We are also aware that this calculus turns out increased in comparison to the real situation since the former doesn't consider the bevel of the angles that the shape of the egg would involve.
- c) In the hypothesis of 21 eggs, commercially listed as great, having a length of cm 5.8 and a width of 4.5 cm, we calculate that the supporting surface is $5.8 \times 4.5 = 26 \text{ cm}^2$ around for a single egg and around 548 cm^2 in total.
- d) We esteemed that the supporting surface in the nest of a brooding large hen is corresponding to 720 cm^2 (anteroposterior diameter cm 30 and transversal diameter cm 24).
- e) Under such conditions, the ratio between the brooding surface and that of the eggs is 1.3 around.
- f) Therefore it is possible to affirm that the brooding in such a nest is compatible with 21 eggs.
- g) If on the contrary the eggs were 23, the general surface occupied by the eggs would increase to 598 cm^2 while the ratio would drop to 1.2.
- h) This allows us to affirm that theoretically - and only theoretically - it is equally possible the brooding in such a nest of 23 eggs too under the same broody hen. Still better if the incubation is occurring with a fair increasing of room temperature in spring and summer.

Thanks to Civardi, both Adelman and Aldrovandi would be quite immune from criticisms, obviously also Coiter if he had given 23 eggs to each hen. But Civardi is perfectly aware that his calculi are something theoretical expressing which in meaningful way is growing apart from what is suggested by the experience of the breeders, an experience synthesized in the following table as well as by the photos documenting the great nest used for calculi (diameters cm 30 and 24) with 12 and 23 big and small eggs and a nest used only for dwarf broody hens, a wood box (sides 28 and 23 cm) with 12 and 23 eggs but only small.

THE BOLOGNESE WOMEN WERE GIVING THE BROODY-HENS NO MORE THAN 17 OR 19 EGGS AS ALDROVANDI IS AFFIRMING AT PAGE 223 OF ORNITHOLOGIA II						
The friends I interviewed were unaware of the reason of my query						
query	Desy Adany	Elly Vogelaar	Fabrizio Focardi	Federico Comellini	Paola Fallaci	mean
large broody hen– how many big eggs?	15	14	15	14	16	14.8
dwarf broody hen – how many big eggs?	5	5	5	7	8	6
large broody hen – how many small eggs?	18	17	21	18	22	19.2
dwarf broody hen – how many small eggs?	10	9	11	11	15	11.2



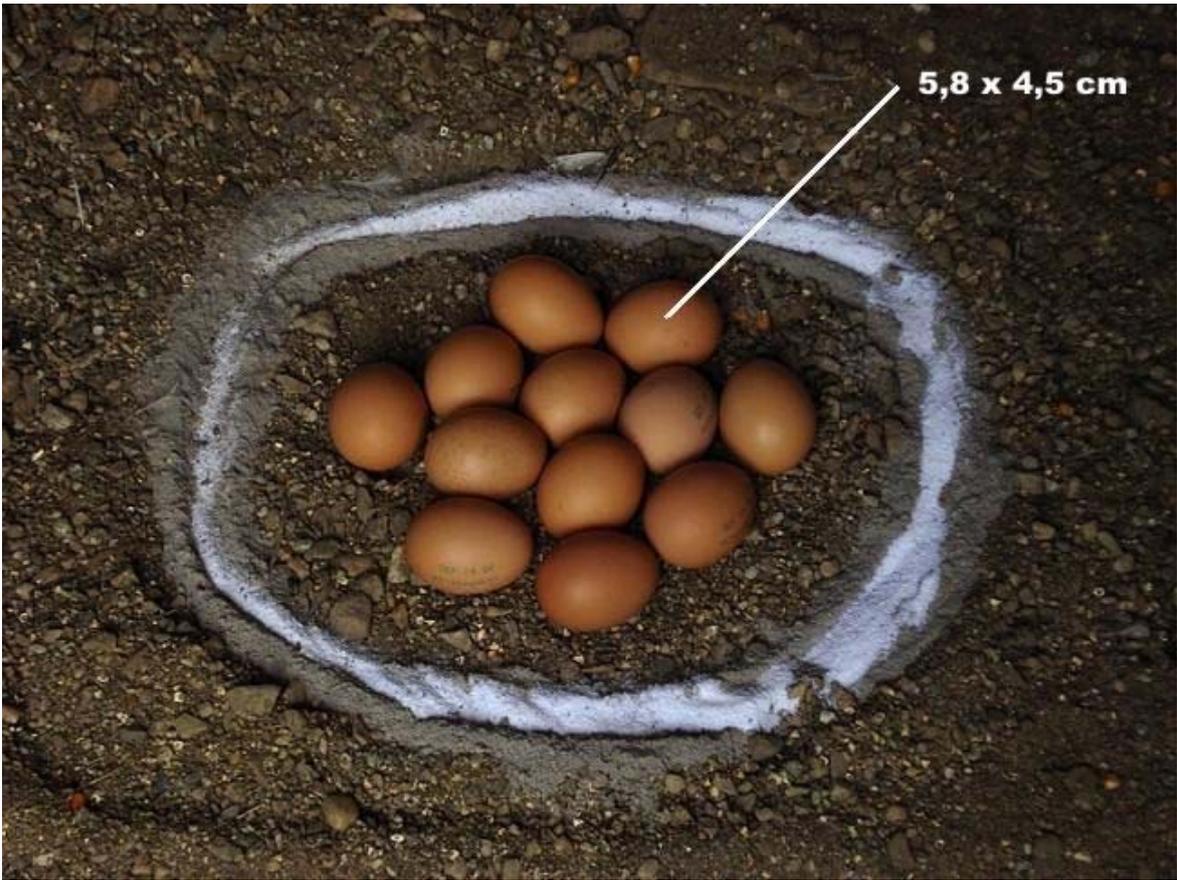
**THE LEGHORN HEN USED TO TRACE THE NEST ON EARTH
HOLD IN HIS ARM BY FRANCO OMODEO CRAFTSMAN OF THE NEST**



DIAMETERS OF THE NEST ON EARTH TRACED BY USING THE LEGHORN HEN



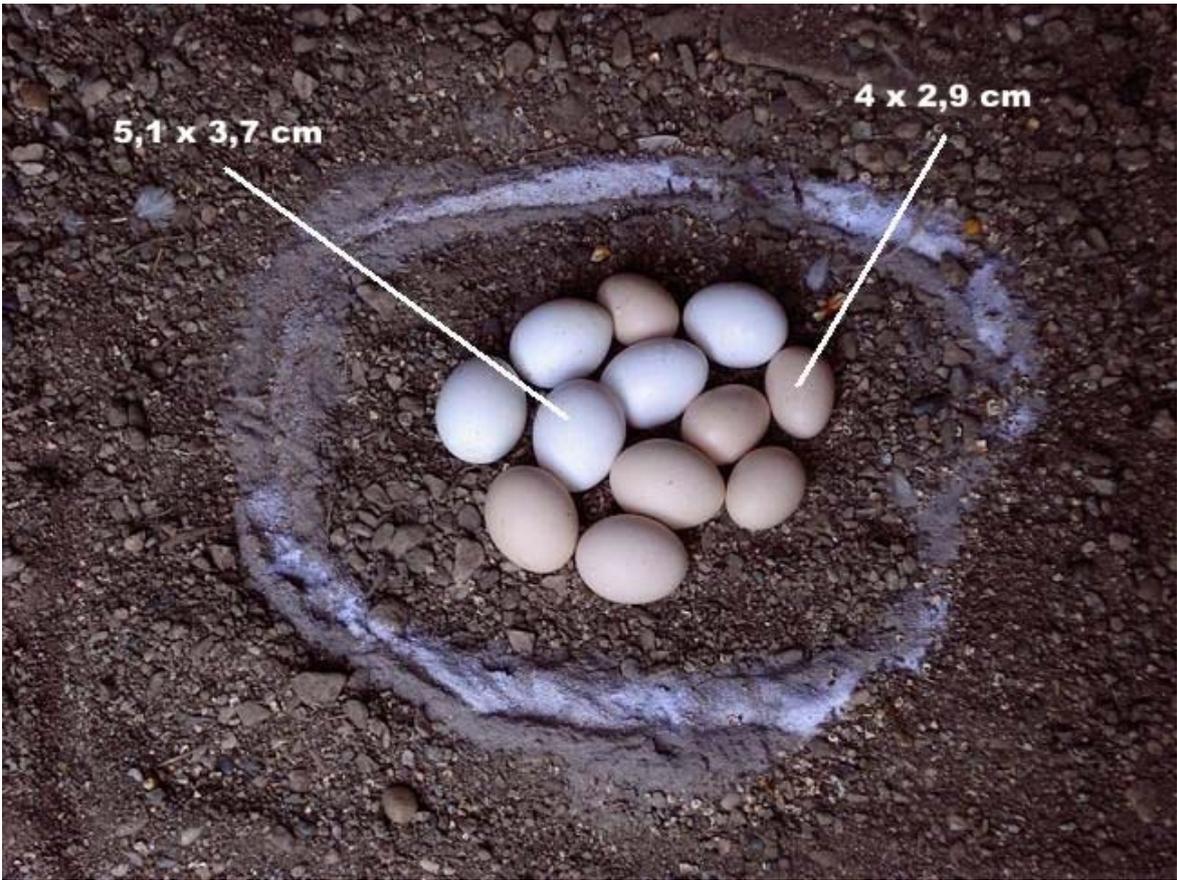
THE NEST CIRCUMSCRIBED WITH WHITE DUST



12 BIG EGGS



23 BIG EGGS



12 SMALL EGGS DIFFERENTLY SIZED



23 SMALL EGGS DIFFERENTLY SIZED



NEST USED FOR DWARF HENS



12 SMALL EGGS DIFFERENTLY SIZED



23 SMALL EGGS DIFFERENTLY SIZED

As we can read in the biography of Coiter written by Nicolas Eloy (1778), perhaps some rumour was circulating about the skill possessed by Aldrovandi in taking advantage of others in a crafty and sneaky way: "Il demeura aussi quelque tems à Bologne, & il disséqua beaucoup d'animaux sous Aldobrandi, habile Naturaliste qui profita de ses recherches, dont il enrichit ses Ouvrages." Translated into English it sounds as follows: "He stayed also some time in Bologna and sectioned many animals under Aldrovandi, skilled naturalist who took advantage of his searches with which he enriched his works."

If that was not enough, neither the name nor the last name of the renowned Dutch man appear in the authors' list used by Aldrovandi in his 3 volumes of Ornithology, a list which opens the beginning of the 3rd volume (1603).

Justice for Netherlands is done. We close with a short biographical note of the famous Dutchman. Along with the biography I cannot skip a creepy end.

**COITER
THE FATHER OF THE EMBRYOLOGY
SURPASSES ALDROVANDI**

Giulia Grazi thought up in raising the dose, being that she wrote me at the end of April 2009 as follows.

« Hi, speaking about the comparison in subject, I quote what is written concerning the two contenders in *History of Medicine* by Ralph Major (treatise in 2 volumes published by Sansoni, November 1959, 947 pages) in my possession.

At page 438 of 1st volume is quoted Aldrovandi Ulisse with the dates 1522-1605 and nothing else; while in the same and in the following page are reproduced 2 tables of plants (Poppy and imperial Crown) and two animals' tables (three-headed Monster and Antelopes) without other notes.

At page 440 always of 1st volume on the contrary Coiter is quoted, about whom there is written: Volcher Coiter (1534-1576, written also Coeiter, Coyter and Koiter) was a Dutchman, born in Groningen, who lived many years in Italy. He studied under Falloppio in Padua, under Aldrovandi and

Aranzio in Bologna, under Eustachi in Rome and under Rondelet in Montpellier. He became physician of Ludovic duke of Baviera and then was appointed city's physician of Nürnberg. He wrote the first book devoted to the comparative anatomy and has been an eminent pioneer in this field. He recommended the anatomists to don't read other works of anatomy than those of Galen, Vesalio, Falloppio and Eustachi. Coiter made a notable description of the development of hen egg, the only work of this kind after Aristotle, except the few observations of Albert the Great. "As far as modern times is concerned, Coiter is undisputedly the father of the embryology"(Singer). He wrote an excellent description of the ear and studied the embryo of the pig, observing that the contraction of the auricles precedes that of the ventricles and that a disconnected portion of the heart goes on with pulsating. His greater realization in anatomy has been the systematic description of the skeletons of a big amount of animals. »

And Giulia was concluding her search this way: « At this point, if the history does justice throughout the time to figures and facts, let's draw the due conclusions...»

For completeness, besides in order to honor Gessner, I would like to add that Ralph Major places him first: if the words he devotes to Aldrovandi are only 4, to Coiter he devotes 181 words and 467 to Gessner. I fear that Aldrovandi is turning himself in the grave and that in some way he will get back at me.

An updating is necessary as demonstration of the fact that in Italy they speak about Coiter like at the times of my university degree. No trace of Coiter also in a recent article of Luciano Sterpellone about Marcello Malpighi: without an explicitly writing, our historiographer of medicine dethroned the Dutchman, defrauding him of the title of father of embryology, universally recognized, also by the American Ralph Major, and assigning this title - by chance - to a Bolognese of adoption who lived in the following century: Marcello Malpighi (*Il giornale della Previdenza* 5, 2009 – page 18 & 19).



VOLCHER COITER
GRONINGEN 1534 - BRIENNE-LE-CHÂTEAU, CHAMPAGNE, 2 JUNE 1576



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