

Zeitschrift: Schweizer Archiv für Tierheilkunde SAT : die Fachzeitschrift für Tierärztinnen und Tierärzte = Archives Suisses de Médecine Vétérinaire
ASMV : la revue professionnelle des vétérinaires

Herausgeber: Gesellschaft Schweizer Tierärztinnen und Tierärzte

Band: 129 (1987)

Artikel: Evolution of Veterinary Anatomy Teaching

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DOI: <https://doi.org/10.5169/seals-593444>

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Schweiz. Arch. Tierheilk. 129, 607–617, 1987

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Evolution of Veterinary Anatomy Teaching¹

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In the last 65 years there have been great advances in the pre-clinical subjects. This is more obvious in the case of biochemistry and physiology. In the clinical subjects new technologies have contributed much also. The use of radio isotope and electronic instruments which exploit semi-conductors have made these advances possible. In the past five years the monoclonal antibodies have brought about spectacular changes in all areas of applied biology.

Jenkins (1982) [1] has referred to the Knowledge Explosion. «This well recognized phenomenon is taking place in every discipline with the net result that the half-life of comprehensive knowledge of any subject is getting shorter and shorter.» He cites what has taken place in immunology, pharmacology, genetics, nuclear medicine and clinical pathology. He states that as each discipline expands it «tends to develop its own character and interests which are then reflected in its Associations and Journals which reflect the advances being made». The paradox is that as disciplines grow apart they have more in common. The present writer, *Evans*, (1985) [2] has stated that 60 years ago the disciplines developed as if along the radii or a circle; in such a fashion as light is split into the primary colours. Now the subjects are coming together again so that the red, blue and other colours are joining to make a more intense bright light to bring about a brighter tomorrow.

Jenkins (1982) [1] adds that «currently available diagnostic equipment especially in the area of nuclear medicine is truly impressive. Ultrasonic imaging is a new superb non-invasive technique. Equally so, computer axial tomography (CAT), positron emission computerised tomography (PET), singlephoton emission computerised tomography (SPECT). These are non-invasive procedures with incredible potential. Digital subtraction radiography has also added an impressive new dimension to X-rays». We may also add Nuclear Magnetic Resonance (NMR).

Anatomy is in a world where the only constant thing is the tendency to change. It would be a most fatal philosophy for us who teach Anatomy to adopt if we said that anatomy never changes. Newer aspects of the subject are being stressed for good reason. It is obvious that anatomy is a basic subject for surgery, medicine and pathology or

¹ Dedicated to Prof. W. Mosimann's 65th birthday.

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sometimes that a service is given to such subjects as Archeology. Most departments of anatomy include histology so that it is apparent that anatomy can contribute to other subjects such as biochemistry when we deal with histochemistry or the study of the organelles of the cell.

One aspect of anatomy that has not changed is that it is still such a fundamental subject. «Inter Mutanda Constantia» was taken as a motto to urge the members of a school to eschew fundamental values such as integrity in a changing world. In spite of many changes anatomy is still the first vocational subject to be taken on. It would be fatal if it were not approached properly. It could switch off a student. It is the hinge subject which connects the pre-veterinary learning with the great vocational subjects; pathology, surgery and medicine.

Plate 1 shows anatomy as being part of an archway holding up a bridge. This supports the whole course and histology is the keystone which connects anatomy to the other vital part of this archway.

The student has an important place in relation to veterinary anatomy. He must obtain from it: Judgement, Observation, Confidence and Manual Dexterity. The vocational nature of the subject should not only satisfy his need to build up a relationship with his future profession but also he should learn from the course that «You get back from your world according to what you put into it». His course should nourish and strengthen his motivation. It should lay the groundwork not only for his technical knowledge but also his philosophy or sense of values. These will he not only take with him beyond the vocational training and the magic goal when he is qualified; but to sustain him beyond this where he is to remain a student all his life if he is to be a successful practitioner. These are the things to take away rather than the overwhelming detail which is excessive baggage.

The knowledge explosion need not frighten us. It means that we prepare properly for it. Just as an athlete is fit the student is fit to take on board the new knowledge to grasp the theme and sift out the dross.

Speaking of Veterinary Education *McIntyre* (1980) [3] suggested that students were transformed from «excitement and conviction» to a «shivering piece of jelly, inarticulate, and often cynical». Obviously Professor *McIntyre* was saying that when things go badly wrong it is because the interest of the student was destroyed. His view certainly condemns the overcrowded curriculum.

Jenkins (1982) [1] has also declared that as medical and animal sciences have developed it has become more and more apparent that to maintain a strong basic foundation has become truly imperative. He adds a word of caution. «They cannot be all encompassing and all engrossing. They must be designed and presented to fulfill their specific role as a vital part of the whole curriculum.»

Changes have taken place in presentation. Some pruning of the subject has been necessary since the student has to deal with much more biochemistry, pharmacology as well as newer «cell anatomy». An example of the better presentation is shown by the elaboration of the intestines by *Nickel, Schummer and Seiferle* (1960) [4]. The diagrammatic representation of the intestines of the dog, pig, ox and horse shows that there can be some intellectually satisfying exercises in anatomy. In the past it was the custom to

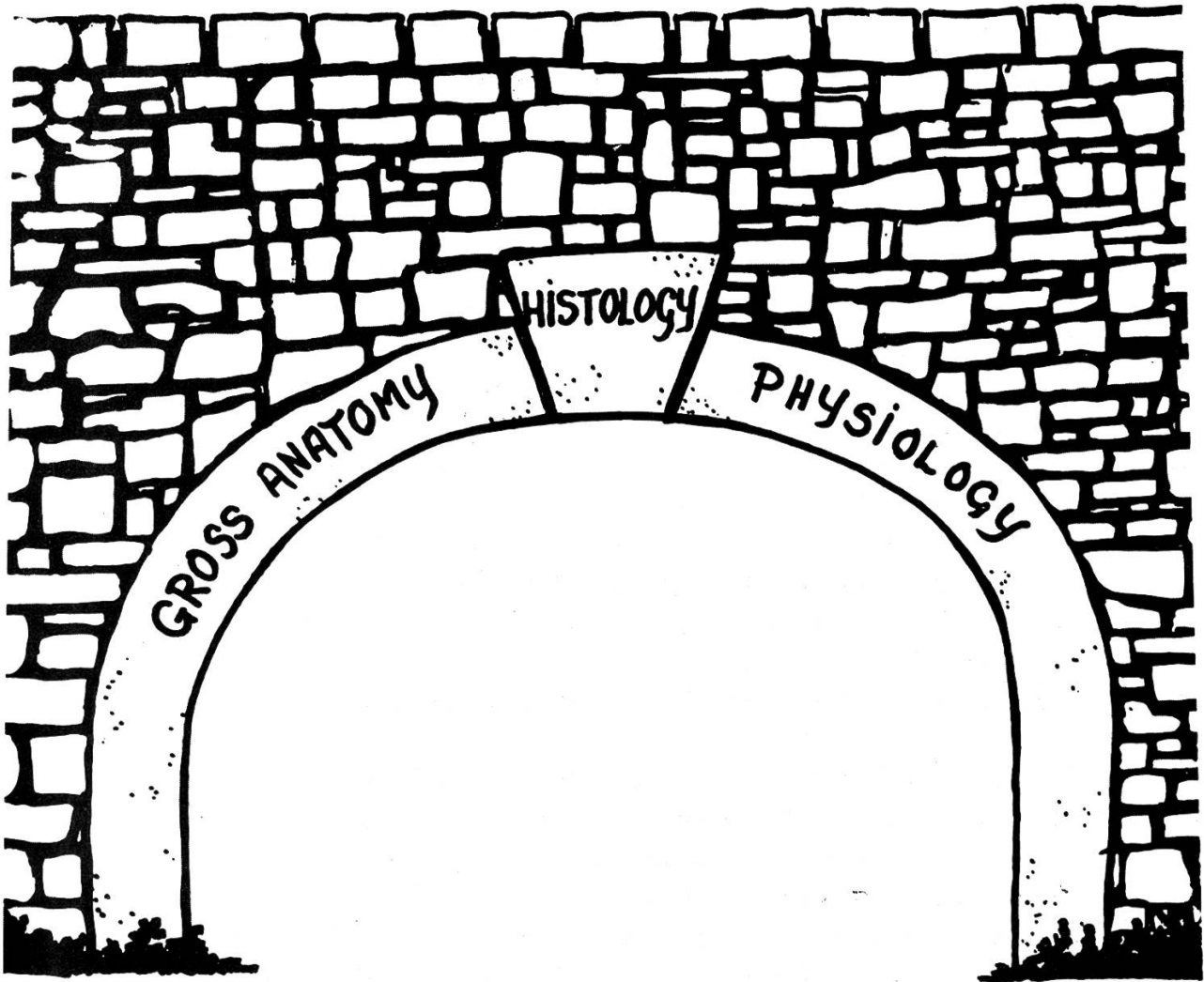


Plate 1: Anatomy is to the rest of the course as the vital arch to a bridge.

stress the differences between species. Now it is much more important to see the master plan. Another aspect of this rational approach is that it shows the relevance of embryology. Embryology has been left out of Figure 1, but it is evident that it is a fundamental part of gross anatomy. Embryology is one of the most exciting of the modern sciences. Areas like the D.N.A. recombination and hybridization are as fascinating as anything in science.

Green (1960) [5] has stated that the beginnings of a serious study of the anatomy of domestic animals were made before the already highly developed human anatomy began to break with tradition. It was inevitable therefore that the method established in human anatomy was directly imitated. On the other hand the work of *Nickel, Schummer and Seiferle* (1960) [4] represents a timely change in direction, a change from descriptive anatomy and the adoption of a more scientific approach. It is also obvious that there is a stress in systemic anatomy to make it easier to understand and remember rather than the geometric description of angles, surfaces and borders. There are two aspects to anatomy. One is a description of those parts which are important for surgery and the second aspect is to give the student an overall picture of the functioning mammal. *Green*

(1960) [4] says it is a question of balance between what to leave out and what to put in: what other details must be included in order to give a rounder picture of the whole structure functional organism rather than merely a pastiche of disconnected parts.

It is often noticed that a point is reached where the information seems to gel in the mind of the student. This critical point is evident say when students have studied the limbs and the trunk of the subject they are able to correlate the details of the blood supply of the trunk and limbs together and see the division of the aorta giving a rational to the blood supply to the fore and hind limbs. The rounder picture will not only be intellectually self-satisfying, but the systematic treatment of the body as a whole will make it easier to remember the details and evaluate the more important points.

An example of pruning can be seen in osteology. Some decades ago there was much stress on the centres of ossification and the position of the nutrient foramen of each bone. Very many of us have a mental picture of the instructor stabbing the nutrient foramen with a forceps with an energy worthy of a better cause. For a quarter of a century I have not seen a nutrient foramen stabbed in anger.

It is worthwhile to examine the changing aspects of both human and veterinary anatomy. *Hooper* (1980) [6] carried out a survey relative to the changes in human anatomy teaching. The table which follows is taken from his work. The most interesting figure is that there is an increase of 60% for the time given to teaching surface anatomy.

Our records would refer to a similar group of veterinary students to the medical students of *Hooper* (1980) [6]. In the years 1977 to 1987 it would appear that the increase in living and surface anatomy would be in the order of 120% while the increase in the Clinical and Applied Anatomy would in fact be of a similar order. In the case of Topographical Anatomy there would be a decrease of 10%. The latter is difficult to gauge as topographical anatomy is intimately linked with the very definition of an organ on the one hand and on the other hand the relationships of each organ is not given the detailed attention that was once the case.

Green (1960) [5] has stated that «As well as having a long-established method of instruction and varied text-books for learning his anatomy, a medical student has another tremendous advantage over the veterinary student. He carries around with him a living text-book. To a non-medical observer, the behaviour of medical students while taking an oral examination is very interesting. All but the weaker candidates will make repeated reference to their own bodies when in the process of answering questions. Their examiners probably barely notice this except to remark its absence in the poor candidates. It is a method of learning that comes naturally to the student and all concerned, examiners and examinees, take it for granted. Although it has obvious restrictions mainly to surface structures, it is nevertheless a means of knowing living anatomy that many a medical man almost certainly makes use of throughout his professional life. He adapts it later by asking patients to carry out various voluntary movements and noting the results, but his unconscious reference point is probably still his own body.»

How much more important is surface anatomy in the veterinary anatomy course. This is evident when the instructor of a small group will get the students to palpate the communicating branch of the palmar nerves in the horse or take the pulse from its dorsal metatarsal artery. The enthusiasm of the students well repays the trouble taken.

Table 1: Change in Aspects of Anatomy Teaching 1968–1978 (Hours)

	1978 Range	Mean	1968 Range	Mean	Mean Change		
Topographical Anatomy	203–295	237	224–500	352	– 115	(32%)	– 133
Neuroanatomy	25– 40	35	25– 90	53	– 18	(34%)	(32%)
Living & Surface Anatomy	0– 14	8	0– 10	5	+ 3	(60%)	
Radiological Anatomy	5– 15	10	5– 10	8	+ 2	(25%)	
Clinical & Applied Anatomy	0– 34	16	0– 30	6	+ 10	(166%)	
Embryology & Development Anatomy	15– 26	2	10– 25	18	+ 4	(22%)	

(Journal of the Irish Medical Association 1980. Volume 73. No. 1.)

Table 1 shows that in human anatomy teaching there has been an increase in applied anatomy. Such an increase has not taken place in veterinary anatomy and although an excellent text has been produced by de Lahunta & Habel, which the present writer finds most useful, we still find applied anatomy hard to place within the curriculum. *King* (1964) [8] stated «A case can be made for applied anatomy to be taught by the clinicians as and when they need it. There is no doubt that a first class surgeon specialising in a certain area knows its topographical anatomy in the greatest detail. Clearly he is the best person to teach this region to his undergraduate. However, it will be an unusual school which has a specialist of this quality for every region in which applied anatomy is important. It is doubtful whether a clinician teaching an area in which he is less intensely interested will always be prepared to master the necessary anatomical detail, and it must be remembered that in any subject, and certainly in anatomy a preliminary mastery of detail is essential before simplifications can be made.» It is the experience of the present writer to observe an anaesthetist going to his lecture with the lumbar bones of the ox, a surgeon with the skull of the horse and another instructor in surgery with the articulated carpus of the horse. It was obvious in all these cases that the areas to be covered in a clinical area was first to be covered in an anatomical way. It could be suggested that a member of the anatomy department attend the class and give the preliminary part of the instruction. The attention of the student is sharply focused on the clinician and the anatomist would in those circumstances have to compete on very unequal terms. To get a more objective opinion by changing the subject to mathematics. The writer has known a very distinguished professor of mathematics who looked at his class and told them in an unfriendly way that they did not understand a certain concept. He spent some time at this and was critical of their education up to that. He could have more profitably used the time explaining the concept and if he liked to see the former teachers of his class. Perhaps what is wanted is more co-operation between pre-clinical and the clinical departments.

A student at university level must do a certain amount of work for himself. *Hullinger R. and Donáth* (1986) [9] have stated that the teacher should be enzymatically involved in teaching. The present writer would rather prefer the word catalyst as this word seems to convey a more dynamic meaning. The involvement of the teacher should increase the students efficiency by a factor of tens. Speaking of general education *Curtin* (1986) [10] said many a good teacher will tell you that it is not the work which he does is important but the work which he succeeds in getting the student to do.

King (1964) [8] has stated «The task of the university teacher is to lead his class through a course of instruction, the responsibility for progress rests entirely with the student: few statements on university education have been more to the point than this comment by *Whitnall* (1939) [16] founded on experience in three universities. The student's notion of a good teacher, on the other hand, is one who dishes out exactly what he needs to a pass the examination, because this enables him to get through with the minimum of thought and work. To quote *Whitnall* again «it is not the teacher's business to save him trouble so much as to make him take trouble. At the same time the teacher must protect the student from work that is useless or even harmful, and this necessitates distinguishing between education and giving information. In education the teacher directs the student to work and think critically for himself».

Education may be defined as leading out (from darkness to light) as a literal translation of the latin root. It may also be said to involve teaching people how to think rather than what to think. Thus will the student be prepared for the knowledge explosion and be able to cope in years to come rather than be processed and packaged for an examination.

Shiveley (1983) [11] has some useful instructions for the anatomy teacher. «Don't ask students to learn and remember things which you cannot. The objective in teaching anatomy should be to help the student develop a morphological foundation for the study of medicine and surgery based on name location, and function . . . the goal should not be to produce anatomists but, instead to contribute to the education of veterinarians.»

Nothing exists in a vacuum. Academic subjects live in an environment. There are a number of factors influencing anatomy. The new technologies, research, the influence of other subjects and outside forces.

Let us take the influence of other subjects first. Unfortunately, there are many veterinary schools where a department of pre-clinical science replaces that of anatomy and the other subjects. This is a tendency which makes it more difficult for anatomy. Some time ago five of our more distinguished colleagues in Europe: *de Vos, Mosimann, Culzoni, Féhér and Pavaux* [12] have declared «Anatomy finds itself threatened in the veterinary world from the interior, the inevitable specialization tends to isolate us from each other, to lessen our cohesive force and finally to render anatomy fragile in its unity. From the exterior, study curriculum reform tends to accentuate this dismantling and make it definitely official under the cover of the integration into other disciplines.»

Four years earlier, in 1974 in the same city, our distinguished American colleague, *Dr. Habel* [13] set out his views on «Academic Freedom for Anatomists». In it he said that the influence of anatomists on decisions affecting the teaching of anatomy had been diminishing under pressure from administrators. He deplored the fact that «the

curriculum in anatomy had been reduced at many schools to a level below the minimum for elementary understanding; inferior autotutorial methods of instruction had been substituted for the necessary laboratory work; the number of students had been increased so that it was not possible for the members of the faculty to maintain the currency of the teaching material, to say nothing of conducting original research». As a remedy he has suggested that we «convince the profession that anatomy is essential to the practice of veterinary medicine, that anatomy is a field of active research requiring constant revision on the subject matter; and that only professional veterinary anatomists are qualified to teach it. We need to direct our research towards solutions of veterinary problems rather than some exotic species».

We have the weight of the most distinguished opinions within the profession urging us to a proper stand on our subject.

One of our newer techniques in the teaching of anatomy is the extensive use of television. In the last ten years or so videos have become the most frequently used media for teaching. In that great human tragedy, the war in Vietnam, the American forces used the T.V. to train the soldiers. They had videos on cleaning a gun; on looking for booby traps and even the proper way to salute an officer. It was the first war they lost and that was due also to the T.V. The generals were interviewed almost nightly and to keep up morale they declared they would win next week. The people back home saw their kith and kin dying on the screens. The T.V. lost the war for them. Thus the T.V. could do more harm for veterinary anatomy than good. A case in point is that a commercial firm selling videos on anatomy stated that these would replace dissection. The videos would be the inferior autotutorial method of Prof. *Habel*. One area where the use of T.V. has shone is where the students themselves made the video. That fits in with the views expressed here already by a number of people that the objective should be to make the students do the work. Used properly T.V. can be a great help to both gross anatomy and histology.

A number of the newer techniques are excellent such as those mentioned by *Jenkins* (1982) [1]. These non-invasive techniques depending on ultrasound can be a great help such as echocardiography. The NMR is such a new technique at the moment but it is only a matter of time until these instruments are as common as the X-ray instruments.

The use of X-rays is also a great help but the information should be confined to structure and clinical or technical details should not be dealt with. *Smallwood* (1984) [14] has made a very good point saying that the plates to illustrate blood vessels should be labelled. It is necessary to have some radiographs for examinations which are unlabelled. The radiograph is taken in one direction and it is necessary to stress this point to the student and orientating the plates will teach the student to be proficient in deduction.

Habel (1974) [13] has suggested that anatomy should have a department, the head of which is unconditionally committed to the subject. That there should be active relevant research carried out there. Some people may have the idea that a research worker gets to know more and more about less and less. A research worker whose interest is in one system or organ has in the pursuit of new knowledge to examine other systems and

instead of being something which narrows the field of vision it often opens new vistas. There is no conflict of interests in being keen on research and teaching. Programmed learning and plastisization may be regarded as new techniques which may help.

Sometime ago results published in the U.S.A. suggested that by listening one learned 30%, by seeing one retained some 50%, but by practical application one retained some 70%. This is said to be the repeat of a chinese saying «I hear and I forget, I see and I remember but I do and I understand». Plate 2 shows this as *Confucius* would have said it. *Dyce* (1978 [15]) has stated that one of the features of anatomy is that one has to learn a big vocabulary in the order of several thousand words. A native speaker uses a vocabulary of 700 to 2000 words depending on the level of education such a person has attained. Learning anatomy involves learning a new language. This is essentially a slow process. It involves repetition and the traditional method of teaching anatomy which involved practicals suited this. Thus there is an excellent example of learning the abstract through the concrete.

The first dissections took place in Italy some centuries ago. The modern methods of education have come round to the project as a method of teaching. A dissection which sets out the objectives is a project and in the modern crowded curriculum it presents a welcome change from all the facts which can overload the memory. The question of balance as set out in Plate 3 would seem the happy medium wherein is the virtue.

我聽過但我忘記了

我明白而且我記得

我做了而且我明白

Plate 2: Thus would Confucius have said «I listen and I forget, I see and I remember but I do and I understand.»

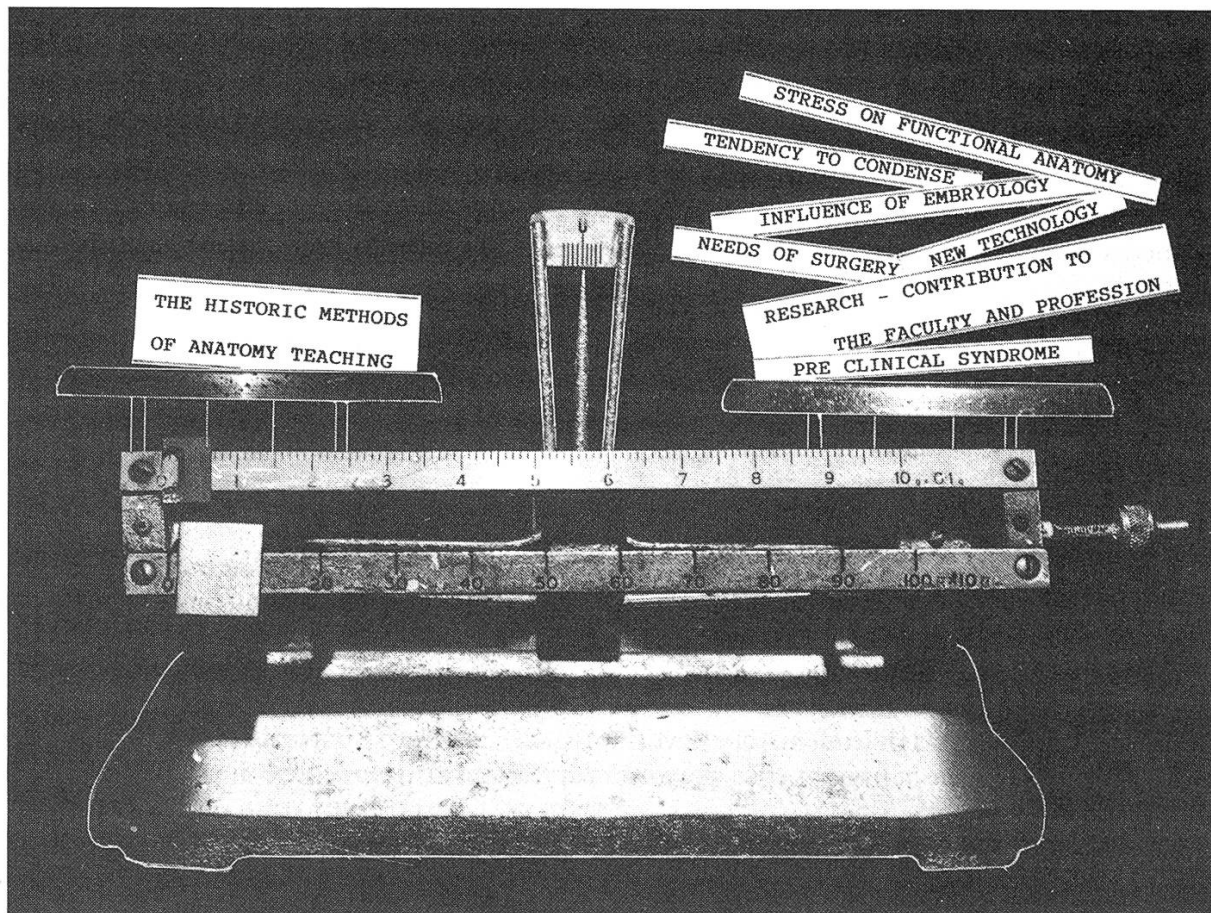


Plate 3: It is a question of Balance between the tried methods of teaching veterinary anatomy and the new techniques.

Summary

The theme of this essay seems to suggest that the instructor should make the student work for himself. This may suggest a penal system or something Dickensian at best. The instructor should create an interest in the subject by his own enthusiasm and commitment. His attitude should show that he believes his subject is important and that he passes on this enthusiasm to the student to last him for the rest of his life. Professor *McIntyre* (1980) [3] suggests that the worst fate which can befall a student is that his interest is killed. He should show that anatomy is not some obstruction standing in the way of the student and the promised land of the clinical years but something that will help him to get the maximum benefit from the clinical years. If the student is to stand beside the subject he is to treat and have some confidence in himself, this confidence will come from what he learned in the dissecting room.

Zusammenfassung

Das Thema dieses Essays will dazu anregen, dass der Anatomielehrer den Studenten dazu anleiten soll, für sich selbst zu arbeiten. Dies könnte vielleicht ein Strafsystem oder bestenfalls etwas aus der Zeit von Dickens meinen, was aber nicht zutrifft.

Der Lehrer soll durch seinen eigenen Enthusiasmus und Einsatz das Interesse am Stoff wachrufen. Seine Haltung soll zeigen, dass er selbst an die Wichtigkeit seines Faches glaubt und damit seine Begeisterung auf den Studenten übertragen, in dem sie sein Leben lang wirksam bleiben soll. Prof. *McIntyre* (1980) [3] glaubt, dass das Schlimmste, was einem Studenten geschehen kann, ist, dass sein Interesse erstickt wird.

Der Unterricht soll zeigen, dass Anatomie nicht irgend ein Hindernis ist, das dem Studenten in den Weg gestellt wird vor dem Gelobten Land der klinischen Jahre, vielmehr etwas, das ihm helfen soll, aus diesen Jahren maximalen Gewinn zu ziehen.

Soll der Student zur Sache stehen, mit der er sich abgibt, und Selbstvertrauen gewinnen, so muss dies aus dem entspringen, was er im Präpariersaal gelernt hat.

Résumé

Le thème de cet essai veut inciter les professeurs d'anatomie à diriger les étudiants, afin que ceux-ci travaillent de manière autonome. Ceci pourrait peut-être faire penser à un système de discipline ou au mieux à l'époque de Dickens. Ce qui n'est pourtant pas le cas.

Le professeur doit susciter l'intérêt des étudiants pour sa branche par son entrain et son dynamisme. Son comportement doit montrer que lui-même croit à l'importance de l'anatomie, il doit transmettre son enthousiasme aux étudiants qui doivent le garder actif toute leur vie. Le professeur *McIntyre* (1980) [3] pense que le pire qui puisse arriver à un étudiant, c'est l'étouffement de son intérêt.

L'enseignement doit montrer que l'anatomie ne représente pas un obstacle aux années de clinique tant louées. Au contraire, elle doit leur apporter une aide maximale durant ces années afin de profiter au maximum.

Si l'étudiant est bien à son affaire et qu'il s'est fortement engagé tout en gagnant de la confiance en soi, il doit pouvoir puiser dans ce qu'il aura appris dans la salle d'anatomie.

Riassunto

Il tema di questa ricerca vuole stimolare docenti di anatomia a far lavorare i studenti per se stessi. Questo può forse far ritenere che si tratti di un sistema punitivo, oppure nella migliore delle ipotesi a pensare ai tempi di Dickens, ma così non è.

Il docente deve con il suo entusiasmo e con il suo impegno illuminare l'interesse per la materia. Il suo comportamento deve mostrare che egli stesso crede alla importanza della materia ed in tal modo a trasmettere l'entusiasmo agli studenti, che deve impregnarli per tutto il corso della vita. Il prof. *McIntyre* (1980) [3] ritiene che la peggior cosa che possa capitare ad uno studente è di perdere il suo interesse.

L'insegnamento deve dimostrare che l'anatomia non è un ostacolo posto davanti allo studente prima del benedetto periodo degli anni clinici, ma che per contro lo può aiutare a trarre il massimo profitto da questi anni.

Se lo studente si colloca positivamente di fronte a questo problema, che egli affronta guadagnando in fiducia, ciò serve a sviluppare quanto egli ha appreso nella sala di preparazione.

Acknowledgement. I am grateful to Miss *T. Buckley* for photography and to Mr. *George Hilton*, M.V.M., M.R.C.V.S. for practical help.

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