FEATURE

Young Writers' Day was only one of the activities sponsored this year by the Federation of Protestant Reformed School Societies. Another was a science workshop. Among the stated purposes of the Federation is the provision of such activities in order to "promote the development, understanding, and presentation of distinctive Christian education." The manuscripts prepared by the three participants in this particular workshop answered well to that purpose. We doubt that Mr. VanDer Schaaf's teaching of a unit on bones in his Junior High anatomy class could ever be the same after the in-depth study he made of that system in the light of God's Word. And though the most benefit is derived by the one who does the writing, we would hope that others who teach human anatomy and physiology will find their own instruction enriched by a reading of what Gary has prepared.

There were three teachers active in the science workshop:

David Harbach and Gary VanDer Schaaf from Adams, and Gary Lanning from Covenant. Mr. Harbach gave his attention to the reproductive system; Mr. VanDer Schaaf, as we said, to the skeletal system; and Mr. Lanning to the muscular. The three papers prepared by the participants testify to the willingness of the authors to work hard and long on the project. In order to share some of it with you, our readers, we thought first of taking excerpts from all three. There are of course advantages to that, but in the end we decided instead to select one of the three and print it in its entirety. Don't let the length deter you. It's instructive, to be sure, but hardly "heavy" reading. It's the kind of thing that, once you start, you're hooked — which, I guess, is the reason we decided to print the whole thing.

The Skeletal System

Gary VanDer Schaaf

I am six years old, and hanging from the water pipes that run the cool dark length of my grandmother's cellar. My hands are cramped around the pipes, and my arms ache, stretched to their endurance. I glance down nervously: the cement floor is feet, yards, miles away. Like a small kitten in a tall tree, I am transfixed: how did I get up here? How do I get down?

"Let go," says my cousin. "I'll catch you. Just drop."

I do.

He doesn't.

I hit the floor, landing, uncatlike, on my side. In my left arm, that softly curving spiral of bone between elbow and wrist, the radius, snaps neatly, cleanly.

Altogether, it will take more than six hours to get me to a doctor, determine that the arm is indeed broken, then set, wrap, and cast the fractured limb. The bone itself, however, responds to the break immediately. In an instant, the body reacts to this breach in its foundation, and millions of the three basic types of bone cells are formed, or transformed from existing cells, and gather about the break.

Osteocytes, which maintain live bone tissue, minister to the areas on either side of the break, making sure that no further trauma to the bone will occur. Osteoblasts, bone-repairing cells, await the completion of callus formation, a sheathlike growth of collagenous protein and cartilage which will unite again the severed bone. Once the softer callus framework is established, the

osteoblasts will fill and harden it, leaving the bone whole and strong again, but with a swollen growth surrounding the area of the fracture, like a burl upon a tree.

Meanwhile, large osteoclasts, giant bone-destroying cells, each containing 10-30 nuclei, have been busy cleaning the area of minute bone fragments. And once the callus is completely hardened, these osteoclasts will break down the extra material, like a sander smoothing down a concrete patch, finally leaving the repaired bone in almost original shape and condition, sometimes even stronger than before, the breach filled, the body's foundation again complete.

The human skeleton, that unseemly and unappealing collection of 206 lengths of calcium and collagen, is indeed the body's framework and foundation. Over two millennia ago, Job observed, "Thou hast clothed me with skin and flesh, and hast fenced me with bones and sinew" (Job 10: 11), and I do not believe that 2,000 years of scientific advancement has provided a better summary of the function of human bone. As a fence defines and protects property, and as a building's foundation determines its size, strength, and shape, so our skeleton protects us, gives us our shape, and sets the broad limits of our physical abilities.

Bones are the only hard tissue within the body, buried deep with in us; it is their strength which supports and upholds our clothing of skin and flesh, just as a home's plaster walls are built upon and upheld by the buried rock or cement foundation. And as a fence protects property so does the skeleton protect our vital organs, the skull enveloping the brain, the ribs covering heart and lungs.

Unlike man-made fences and foundations, however, bones are not inanimate, static things. Not only does the skeleton, in conjunction with the muscular system, give us freedom of movement, but it is itself a dynamic, growing, changing, living thing.

An infant is born with a "skeleton" of some 350 "bones." Some are true bones, calcified and hardened, but many are still soft cartilage. A baby with the firm skeleton of an adult could not undergo or survive birth. Its small body would be too rigid and incompressible, unable to pass through the birth canal.

Throughout life, the bones will calcify, coalesce, expand, lengthen, and finally shrink, while constantly tearing down and rebuilding themselves. The virtually boneless skull of the infant will not harden and grow to close off the last of the openings, the fontanelles, until the child is two years old. And the then bony plates will still not be completely

coalesced even four decades later.

Every bone in the hand of that two-year-old will replace itself by the child's third year; not one will be the same. The 26 bones in each of the child's feet are especially active; they will not be fully and finally formed until he is 15, a fact that dismays parents and delights shoe salesmen.

But because the skeleton is a living thing, it is subject to the law of death. And die it does, like the rest of the body, slowly at first, then more rapidly, finally ending in a frenzy of self-destruction in a headlong rush to the grave. The bone-building osteoblasts which dominated the first half of life gradually become less active, and the bone-destroyers, the osteoclasts, begin to dominate the body. The amount of annual bone replacement, 100% in youth, plummets to under 20% after age 60.

And the rate of that replacement grows slower each year. The fractured arm of a four-year-old will heal within 4-8 weeks; the same fracture in a 65-year-old may require nearly twice that time to mend, if it will mend at all. Then, that which once was made well by a simple splint and cast demands surgery, possibly a bone graft, metal screws, pins, and plates, perhaps a teflon joint, and weeks of therapy to be made, not as good as new, but merely functional.

Bone replacement lags further and further behind bone destruction. That which was once gently rounded becomes pointed and sharp. The chin bone grows more pronounced, the jawbone pulls inward, the hip-bone protrudes, and its now brittle structure threatens to turn a fall into a disaster.

The old find that their clothes no longer fit. Shirts and blouses are tight across the shoulders; slacks and pants are too long. What is happening? The body's frame, the skeleton, is shrinking. If this shrinkage is uneven, and if the person has a history of calcium depletion (common among women), the bones will slowly deform. The strong men of Ecclesiastes 12:3 will bow themselves: spine and femur, tibia and fibula will bend and stay bent. Grandmother and Grandfather will totter out to greet you, stooped and bow-legged, smiling faces pinched and pointed, their bent and failing bones a testimony to their sojourn in a fallen world.

Yet for 70 or more years the skeleton will fulfill its fourfold function. It will give shape to the body, protect vital organs, house red marrow for blood cell production and store fat for energy reserves, and provide that system of levers, operated by the muscles, which gives us movement. These four functions both

reveal and underscore the fundamental nature of bone and the skeleton, and it is that nature, or rather two aspects of it, which form the subject of the pages which follow.

UNITY

The first picture that bone presents is that of fundamental identity, oneness, and unity: identity of self, oneness of self and mate, and unity with God through unity with the body of His Christ.

Scripture frequently uses part of the body – bone – to refer to the whole. This is not mere synecdoche. When David wishes to express the totality of his commitment to and adoration of Jehovah, he writes

> And my soul shall be joyful in the LORD: it shall rejoice in his salvation. All my bones shall say, LORD, who is like unto thee. . . (Ps. 35:9, 10a).

Note the parallelism: soul and bone respond as one. The sweet psalmist's entire being is dedicated to praise as he approaches the throne of the Almighty and prostrates himself before it. Bone is fundamental. What it feels the whole body experiences. Where it goes, the rest is sure to follow.

In like fashion the writer of the Epistle to the Hebrews uses the picture of a rendered skeleton to complete his picture of the all-encompassing and profound power of the Word over and within the lives of men:

> For the word of God is quick, and powerful, and sharper than any two-edged sword, piercing even to the dividing asunder of the soul and spirit, and of the joints and marrow, and is a discerner of the thoughts and intents of the heart (4:12).

Mind, soul, spirit, joints and marrow, man is a fundamental unity of all these things, the immaterial and the corporeal, and the Word has dominion over all that makes man himself.

Our Saviour also uses bone to identify Himself as "very man." Upon His first post-resurrection appearance to the gathered disciples, Jesus must first assure them that He is indeed Himself, not a phantom or spirit: "Behold my hands and feet, that it is I myself: handle me, and see; for a spirit hath not flesh and bones, as ye see me have" (Luke 24:39).

In effect, Jesus says, "Look, it is I. I appear to you not as spirit but in a body, new and glorified. But I am still Myself; the clothing of this new flesh still hangs on a framework of bone. I am the first-fruits of the grave, not a ghost. I am indeed the New Man, and I am risen."

Because of its fundamental nature, the skeleton does much to

determine, physically, who we are and what we do. Man is created to be lord of creation, called to subjugate creation to the praise of its Creator. To this end, our bodies are framed with bones, which enables us to traverse this earth. (Quite literally so. Even in our non-ambulatory age, the feet and leg bones of the average American will carry him over 65,000 miles – more than twice around the globe.) Many creatures are able to stand and walk on two legs for brief periods, but only man, the intended master of such beasts, has a skeleton designed that he might stand and walk erect for 70 years. And although many creatures have hands, even hands with an opposable thumb, man alone in creation can touch the tip of his thumb to the fingertip of his forefinger, due to a skeletal arrangement unique to man, without which manipulation and mastery of the environment would be impossible.

One could go on and on about how bone and skeleton are structured to allow us to function in our God-ordained roles. The skeleton and its component parts are an architect's primer-book: a system of obdurate columns, hollowed to provide the maximum strength with the minimum of material, cushioned and jointed and arched to absorb shock and distribute stress, supporting every cell in the body yet comprising only 1/5 of its weight. Light but durable (remaining intact centuries after the flesh returns to dust), inflexible yet providing a range and finesse of movement unparalled in nature. And bone is alive. It maintains, repairs, and replaces itself continually. It grows as we do.

As a junior-high teacher, I am surrounded by growing skeletons nine months of the year, and I am always amazed at the outward evidences of a living skeleton changing itself to prepare its owner to function in the adult world. The small boys who enter 7th grade metamorph into towering 9th graders, and their lythsome, curveless little-girl classmates will graduate two years later, well-rounded in more ways than one as their growing, changing skeletons prepare them for their places in God's earthly kingdom.

In these days of godless feminist philosophy and uni-sex culture, the skeleton maintains a rigidly chauvinistic witness to fundamental differences between male and female, and accordingly, to the God-ordained roles of each sex in the home, church, and society. Generally speaking, the male skeleton is larger, its bones thicker and stronger than the smaller and lighter bones of the female. Male bones exhibit a slight difference in structure

which allows for a muscle, ligament, and tendon arrangement that provides more efficient and smoother motion, and a teacher can tell his students that this difference is the reason why a girl throws a ball, swings a bat, and runs like. . . like. . . well, like a girl. In short, a man's skeleton outfits him for harder, more physical labor. It is a fitting framework for one who is called to lead and to provide for a family.

And even if our perception of the implications of the differences between the overall size, structure, and strength of male and female skeletons becomes clouded in our day of "househusbands" and female body-builders, the skeleton maintains one startling and irrefutable testimony to the uniqueness of each sex's structure and function – the pelvis.

A male pelvis is narrow and heart-shaped, its bones heavy and very hard, its inner ring lined with knobby, hooked points to which the muscles and ligaments attach. The acute angle of the inner opening brings the hip-sockets closer together, nearer the body's center of gravity. Altogether, it is an arrangement providing a powerful lifting of the upper body and fluid, efficient movement.

The female pelvis is quite another story. Upon puberty, its lighter, more flexible bones broaden in anticipation of pregnancy: it will have to support a child-filled womb, and the inner opening grows larger, more obtuse, to permit the passage of the baby. This pelvic flaring pushes the hip-sockets out, away from the body's center of gravity, and in conjunction with a muscle and ligament attachment different from the male's, producing the rolling, less efficient but distinctly feminine walk (which, alas, some young ladies are inclined to exaggerate).

Finally, the inner ring of the female pelvis is smooth and oval. The projections for muscle and ligament attachment present in the male pelvis are absent, and the opening is unobstructed, precisely the size of an infant's head. All-in-all, the female pelvis is a structure clearly designed for child-bearing, and we should remind our students, when they are of appropriate age, that while perhaps the young ladies may not be able to throw as far, jump as high, or run as fast as their male classmates, it is their unequaled privilege, attested to by their very bones, to bring forth covenant seed.

Scripture, in addition to using bone as a picture of essential personhood, also uses bone as an image of kinship unity. II Samuel 19:13-14 records David's reaction to Judah's absence at his return to Israel after Absalom's rebellion.

The disappointed king cries out:

> Ye are my brethren, ye are my bones and my flesh, wherefore then are ye the last to bring back the king? And say ye to Amasa, Art thou not of my bone, and of my flesh? God do so to me, and more also (note close identification with self implied, GVS) if thou be not captain of the host before me. . . .

This use of bone as a picture of extended-family unity is found throughout Scripture (Gen. 29: 14; Jud. 9:2; I Chron. 11:1) and has an interesting parallel in the field of animal classification. The outward appearance of a marlin, a shark, and a dolphin would suggest some taxonomic relationship among them. An examination of their respective skeletons, however, reveals that the shark has no true skeleton at all, only cartilage, and that the skeleton of the dolphin resembles more closely that of a mouse, a fellow mammal, than that of the marlin.

Consider also the panda bear, the polar bear, and the brown bear. Outwardly, the animals are very similar, yet most taxonomists are reluctant to classify the panda bear as a bear at all. Stripped of its charming fur coat and mountains of flesh, the "bear's" skeleton reveals a close similarity to that of a raccoon. And a polar bear's skeleton resembles nothing so much as the skeleton of a wolverine (if there were such a thing as a wolverine the size of a volkswagen), an implied kinship that is, perhaps, mirrored in the extremely aggressive natures of both animals — wolverines do not hesitate to threaten grizzly bears, and a polar bear is the only animal that will hunt man.

That Scripture uses bone to picture familial relationships should come as no surprise, for it was bone from which the first family was formed. So closely did God wish Adam to identify with Eve, so intimate a union does God intend the marriage relationship to be, that God took from Adam's own skeleton, his own frame and foundation, that from which his mate would come.

In his commentary on Genesis, John Calvin describes the divine purpose behind the means of Eve's creation in this manner:

> . . . that the conjunction of the human race might be the more sacred, He (God) purposed that both male and female should spring forth from one and the same origin. Something was taken from Adam, in order that he might embrace with greater benevolence a part of himself. He lost, therefore, one of his ribs, but instead of it, a far richer reward was granted him, since

> he obtained a faithful associate for life. For he now saw himself, who had before been imperfect, rendered complete in his wife. And in this we see a true resemblance of our union with the Son of God: for He became weak that He might have the members of His body endued with strength (pp. 132-33).

That Adam understood the significance of the means of Eve's making is evident in his first words upon beholding her: "This is now bone of my bone, flesh of my flesh" (Gen. 2:23). Adam could love his wife, care for her, and nourish her as he would his own body (Eph. 5:28-29) because inwardly and fundamentally they were one – "bone of my bone" – and so, naturally, the union of their flesh into one flesh would follow.

And, finally, building upon this image of "bone of my bone" inherent in the marriage union, Scripture describes our eternal covenant union with God in terms of bone. By adoption we enter the family of God, and claim Jesus as elder brother. But even this blood relationship does not describe the depth of the intimate and sweet communion our God has decreed for His chosen friend-servants. By the gracious mercies and mysteries of the covenant we are made part of Jesus Himself. This does Paul declare in Ephesians 5:30, "For we are members of his body, of his flesh, and of his bones." Thus our unity with Christ is complete and fundamental, total, absolute, and everlasting. We are flesh of His flesh, bone of His bones, in Whom dwells the fullness of the Godhead bodily. Do you know this in your heart? Can you "feel it in your bones"? They testify to its very truth.

LAW

My junior-high students loathe rules. They want to do and say what they want, whenever and wherever they want. "Our mere presence here in school," they seem to think, "is quite enough. Don't make it worse by trying to tell us how to behave."

Christian teachers, in turn, despise and labor against this attitude, sometimes growing very angry at those who exhibit it with soul-wearying consistency, sometimes forgetting that it is often our own attitude toward our own participation in the body of Christ.

Rules of behavior – the law – and rules of belief – doctrine – have fallen on hard times. The law, say its detractors, is negative and restrictive, denying the positive freedoms we enjoy in the new dispensation of Christ and His Spirit. And doctrine? Dead and divisive, the binding and

bitter fruit of struggles long since forgotten. The church of God, after all, is one body. We should have no creed but Christ.

Those who confess this may belong to a body, but it is not the body of Christ. The body to which they belong has no strength: it cannot stand, and is buffeted about by every wind of doctrine. It has no support, no structure; it is shapeless, shifting, and ever-changing, and cannot be part of the eternal, immutable Word. It has nothing by which its several parts are united and made one, and thus its ecumenicity is a perverse parody of the brotherhood of all believers and of the one, holy, catholic church. It has no foundation on which to grow, nothing on or by which to build an edifice of praise to the glory of the Father, and thus it has no purpose. This body is like a house built upon the sand, like a skyscraper without a core of steel. Or like a body without bone.

Bone and skeleton are a picture, I believe, of God's law and of the truths of His word and like many Scriptural images, a picture that operates on many levels. Notice first the natural human reaction to a skeleton: in the words of one of my 7th grade students, "Oh, gross!!" Like the law, the skeleton holds no natural appeal for natural man. It is an offense to the senses, the stuff of horror and nightmare.

Our natural aversion to a skeleton stems in part from the stark reality it presents. Again, as one student remarked upon seeing a human skeleton, "You mean, that's ME?" Yes, that is you. Stripped of our fleshly clothing and all the added adornment we smear, spray, and hang upon it, we are not pretty things. In like manner is the law of God's word a schoolmaster, revealing us for what we are apart from grace: vile corpses in animated rebellion against the living God. All self-deception as to our innate goodness and beauty is just that — a lie. Apart from Christ's body and His revivifying Spirit, we are all whited sepulchers, full of dead men's bones.

Our appreciation of the picture of bone as law is increased when we consider the many Scripture passages that speak of bone in association with God's law and the truths of His word. The verses that speak of aching, shattered bones as a result of sin or that tell of the destruction of bone as a sign of God's wrath against the covenant-breaker and infidel are so numerous that only three of the most familiar passages, all found in the Psalms, are given here:

> My strength faileth because of mine iniquity, and my bones are consumed (31: 106).
>
> When I kept silence, my

> bones waxed old through my roaring all the day long (32:3).
>
> There is no soundness in my flesh because of thine anger: neither is there any rest in my bones because of my sin (38:3).

Conversely, obedience to the law and spiritual restoration are pictured by strong, healthy bones:

> Fear the LORD and depart from evil. It shall be health to thy navel, and marrow to the bones (Prov. 3:7b, 8).
>
> And the LORD shall guide thee continually, and satisfy thy soul in drought, and make fat thy bones (Is. 58:11a).

Are there lessons to be learned from these word pictures? I think so. First, we can see that sin is a profoundly serious thing. Sin is grievous; it is all pervading, infecting and inhabiting us, as it were, at our core, our very bones. C.H. Spurgeon, reflecting on Psalms 6 and 51, remarks that sin is "no mere flesh wound." Rather, "the solid pillars of the house of manhood are shaken." Sinful man cannot stand before God: the knowledge of our sin is a rottenness in our bones. We tremble in fear, bones shaking, reeling and falling like drunken men "because of the words of His holiness" (Job 4:14, Jer. 23:9, Hab. 3:16).

Secondly, we understand that broken law, like broken bone, violates harmony and unity. Unconfessed sin is like an unset fracture: a source of pain, misery, and deformity. In the impenitent state we are vexed, poured out like water, and all our bones are out of joint (Ps. 6:2; 21:14). Our bones provide no support and allow no rest (Job 30:16-17), for our sins rise up against us, like ribs against shrunken flesh, to remind us that we have broken the covenant that unites us with God, that we are living outside the body, not members of it but enemies to it, enemies that will be cut off, burned, utterly destroyed as would be diseased and cancerous bone.

Yet the Great and Loving Physician has sent His Son, with healing in His wings, to heal that which is wounded and to bind up that which is broken down. Even as our sin and our disobedience to the law and truth are pictured in broken bone, so is our salvation found in Him Who *is* Truth, Who kept the law perfectly, Whose bones were kept whole: not one of them was broken (Ex. 12:46; Ps. 34:20; John 19:32-37). Then does the healing and Holy Spirit apply the Balm of Gilead to our broken selves, and then again do we hear joy and gladness, and the bones which were shattered do rejoice (Ps. 51:8).

There remains one more lesson

to learn, or, if you will, one final warning to heed, and that is the lesson and warning found in Ezekiel 37:1-15: the macabre vision of the valley of dry bones.

In the valley Ezekiel sees the bleached bones of the scattered skeletons of "the whole house of Israel, dead in its own conceit, lifeless in its national sin of outward obedience and works-righteousness, withered and dry and blasted to the bare bone by the heat of God's indignation. Here is a glimpse into the charnel house of man's efforts to live apart from God's law and to save himself apart from God's grace. But even as the vision progresses, and the skeletons are reknit and clothed with flesh, we witness that Israel is yet dead. God withholds His breath, His reviving Spirit, from them. Only when God pours out His Spirit do the flesh and bones of the house of Israel arise from the grave and enter into a living relationship with their covenant Head.

So it is with us. We must constantly beware of "dead bone," of dead orthodoxy, of outward compliance with the law, of our natural inclination to the heresy of salvation by works.

Only when bone is alive can it fulfill its functions; dead bone is harmful, worse than useless, fit only for removal and destruction. Thus God's law must be within us a living and growing thing, ever enabling us to live and move and have our entire being in obedient living to the praise of the mercy of the Father. Man is not an insect, and neither is he crustacian or mollusk; his skeleton is not a dead thing worn without, but a living part of him, within him, protecting and nourishing him, giving shape and purpose to his being.

Therefore the law of God and the love of His Word must be written deep within us, and our innermost man must be renewed. When dead bone is removed from the body, the surgeon will graft into its place a section of healthy bone from elsewhere in the body. But spiritually we are dead throughout, and such an intrapersonal transplant is impossible. When God said to Ezekiel, "Son of man, can these bones live?" the prophet's hopeless reply was, "O Lord God, thou knowest." The question is rhetorical, the conclusion foregone.

Foregone, that is, as far as man can comprehend. "As thou knowest not what is the way of the spirit, nor how the bones do grow in the womb of her that is with child: even so thou knowest not the works of God who maketh all" (Eccl. 11:5). With God all things are possible, and with such dead bones as we has He made covenant. In faithfulness to Himself we are made new. Like branches grafted into a living vine,

we are grafted into the living body of Christ, made living members of His body, of His flesh, and of His bones. Only in the strength of His scarred flesh and unbroken bone can we withstand the assaults of the evil one, and clothed in the righteousness of His unbroken obedience alone are we able to stand, not merely before God but with Him and in Him, united in eternal, unbreakable covenant fellowship.

What Christian science teacher has not envied Adam unfallen, able intuitively to determine exactly God's purpose and plan for each facet of creation? It is so very hard for fallen man to ascertain God's hand in creation, to discern God's message there, to hear His voice amid the babel of our own confusion. Every year I teach, I am reminded of that old Puritan prayer:

God, forgive me if I know
many things, but know
not thee alone,
If I hear many things, but
heed not thy voice,
If I see many things, but see
not Jesus only.

In these pages I have tried to present a few ideas about one small yet significant part of God's world, the human skeleton, ideas based upon what I hope is an accurate and sanctified reading of God's word. As do God's people everywhere and always, I have found that word comforting and instructive and, no matter how dim our understanding of it, "sweet to the soul, and health to the bones" (Prov. 16:24). Even as sinful creatures we are knit together by the hand of God, and fearfully and wonderfully made. And as far as we are in Christ, and as we shall be in perfection, these things are mysteries, even for the angels.