WILL OUR NEW NAVY BE OLD BEFORE IT IS COMPLETED?

Question Is Raised as to the Possibility of Carrying Out the Building Programme Authorized by Congress to Provide New Fleet

Why Our Latest Battle Cruisers and Superdreadnoughts May Be Surpassed by the Quicker Building Nations Before They Can Be Launched

By ROBERT G. SKERRETT.

HAVE we started too late to catch up with the procession in the matter of naval preparedness? Can we build the ships last authorized by Congress and have them fit for service in 1921?

These are serious questions and they involve factors and consequences not generally understood by the public.

Congress made generous appropriations for the navy last August and committed itself to a building programme extending to July, 1919. The President was authorized to undertake the construction of ten battleships, six battle cruisers, ten scout cruisers, fifty torpedo boats, nine fleet submarines, fifty-eight coast submarines and a number of smaller craft. That programme involved the spending of some hundreds of millions of dollars.

Secretary Daniels in his annual report, made public early in December, detailed the array of battlecraft which would be completed and in commission in 1921. No doubt the ships should be finished by that time, but the question is, will they?

Two and a half years earlier Mr. Daniels might have been better warranted in making his confident prediction. Then American shipyards wanted work, steel plants would have welcomed the orders for structural material and for armor, and the labor market would have been able to supply the needed workers at normal wages. To-day all this is changed.

The shipyards, having a capacity for about 800,000 tons, are struggling with orders totalling 1,200,000 tons, and the bulk of these vessels are merchant craft that pay well and are for speedy delivery. Their building but little resembles the exacting requirements imposed by Government contracts. The situation is a feast after a fairly long period of industrial famine in this branch of our native industries.

The steel mills are overtaxed and there never has been a time in the history of that business when unfilled tonnage reached anything like its present volume. Prices, accordingly, have soared well nigh week by week. Apropos of this situation Rear Admiral David W. Taylor, Chief of the Bureau of Construction and Repair, gave this illuminating testimony a month ago during a hearing before the Committee on Naval Affairs of the House of Representatives. He was asked to give approximately the increase in the prices of materials and labor over those of normal times. He said:

"Compared with two years ago, I believe that, so far as warship construction is concerned, there has been an increase of about 100 per cent. in cost of material and about 30 per cent. in labor costs. In this connection I might add that if it were the intention to duplicate battleships 45 and 48 this year I would ask a limit of cost of $12,250,000 as against $11,500,000, the limit of cost of those vessels as provided in the last bill."

Not only are we face to face with added costs but the labor market cannot meet the demands for skilled workers. Starting right in the draughting room and going on through the machine shops and into the yard, the shipbuilders lack men, and this explains why wages have increased to the degree described by the Chief Constructor.

The private shipyards are not the only ones that are suffering. The Government plants are even worse off, because wages cannot be changed there to suit the needs of the hour. The private shipyards have become the Government's competitors in the labor market and are generally offering higher remuneration. Good evidence of this is the difficulty which is confronting the New York Navy Yard in getting the New Mexico far enough along to launch her. There is a lack of riveters, and all because the commercial yards are able to pay better wages.

More than once the Secretary of the Navy has balked at the prices asked by American shipbuilders, steel plants and manufacturers of munitions, and he has boasted of the savings which he has effected by utilizing Government plants. He has likewise felicitated himself upon the reductions he has been able to force in the price of armor; and less than a year ago he declared he had been able to get protective plating $1,200,000 cheaper. But conditions have reacted.

He can't get the navy's ships built at anything like previous prices, and private shipyards are not tumbling over one another in their desire to get Government contracts. Indeed, they are holding themselves in effect aloof although in fact submitting bids. Their proffers include heavy costs per ton unit and they are indisposed to guarantee delivery within constructional periods heretofore deemed ample. They feel that the labor and material markets are too uncertain to admit of promises of rapid construction.

And Mr. Daniels, who has believed it a wise policy to encourage the building of capital ships in navy yards, is virtually forced to seek relief through Government plants, but here unfortunately he is confronted by a discouraging handicap. The Government yards are actually not equipped to engage in the building of any considerable percentage of big ships, and while Congress is disposed to provide the funds for the equipping of our naval stations for this purpose, the fact remains that it would take many months to put those under consideration in a state of readiness to begin work on the battleships and battle cruisers that are necessary to our fleet.

There isn't one of our navy yards now prepared to undertake the construction of the great battle cruisers last authorized, and under the most favorable circumstances it would probably take a year to prepare the foundations and to rear the slips with their travelling cranes and other indispensable working facilities. While the private shipyards are better circumstanced, still even these plants would have to spend considerable time in getting ready before beginning the construction of battle cruisers, and some of them would actually have to add to their building ways if they undertook contracts for any of the new dreadnoughts.

The battle cruisers present unusual problems because of their exceptional length—more than 800 feet, while the superdreadnought New Mexico, now building, is only 600 feet long. The New York Navy Yard, which undoubtedly is the best fitted naval station, hasn't room for a ship of this character and if the Norfolk yard is fitted for the work, as is proposed, there is certainty of delay until quay walls, ways, workshops, tracks, &c., are made ready.

Here, too, in some directions the fitting out of Norfolk would be halted or handicapped by the abnormal state of business in the engineering and structural steel industries. The whole trouble is that we have started too late to increase our fleet on a large scale and within the period set by Congress. Mr. Daniels's bargaining with contractors has been so keen that the opportunities for business were attractive only when trade conditions otherwise were not at their flood. Who wants Government work upon the Government's exacting terms when ship owners, both foreign and domestic, are willing to pay handsomely and to waive niceties in order to get their craft afloat and in service?

It is quite evident from Mr. Daniels's own statement in his last annual report that he realizes that our sea borne national defence has come to a grave point in its progress toward ample strength; and while he thinks "that the shipyards will rise to the occasion and accomplish what was regarded as impossible but a short while ago," still there is apparently lurking in the back of his mind the conviction that something radical must be done in order to carry out the present building programme. This is clearly evidenced by one very significant paragraph in his report:

"The last naval bill does not give to the Department any additional or extraordinary powers in connection with placing the contracts for these vessels or in obtaining materials for their construction. It is hoped that the necessity will not arise of having to ask for such powers, as a number of shipbuilders and manufacturers have shown an attitude of willingness to assist the Department in meeting the unusual situation created by the desire of the country to commence and to expedite an entirely unprecedented naval programme at a time when the industrial resources of the country are already taxed to their utmost capacity in meeting the demands of tremendous trade activity, both domestic and foreign, in every branch of business. It may be necessary, however, for Congress to enact legislation of this character to insure the early completion of the programme of construction."

The Navy Department has offered to pay the private shipbuilders very substantial bonuses for the prompt construction of our latest dreadnoughts and battle cruisers, but despite this inducement not one of them has been influenced by a premium that would ordinarily have aroused the keenest kind of competition. This is the attitude of the private shipyards even on relatively small craft. Admiral Taylor gave this information to Congress near the end of November:

"In the case of the destroyers we wanted to build them in twenty-two months, and we specified a premium period such that if they built them in twelve months they would get the 20 per cent. you specified. None of the people who bid for destroyers wished the premium provision in their contracts and most of them, instead of bidding twenty-two months, bid twenty-four months and over."

When bids were opened for battle cruisers some weeks ago the shipyards came forward and offered to construct all four of the giant craft, and made various propositions as to either following the Government's designs or substituting modified plans of their own. The time in which they would undertake to have the vessels ready to turn over to the naval service ranged from forty-eight to fifty-one months.

While undoubtedly larger than any battle cruisers now afloat abroad, still the difference in size is not such as to warrant any marked increase in the structural problem, and therefore our shipyards should be able to come closer to the speed of building of our foreign rivals. It is a matter of pretty common knowledge that England has laid down, built, equipped and commissioned great battle cruisers within a period of eighteen months. Why, then, should not we be able to achieve as much in at least twice the time?

Four years is a long time with international relations what they are to-day, and with things moving forward with their current swiftness fifty months from now may either find these battle cruisers obsolescent or the odds against them overwhelming numerically and offensively, even if these ships are somewhat speedier than their opponents. The fleet needs them now, or as quickly as it is humanly and mechanically possible to fabricate them.

It is not uncommon with us to proclaim our engineering intentions with something of a parade. Frequently we announce that we are going to have the biggest this and the most formidable that, and somehow another nation slips ahead of us. Capt. Charles W. Dyson of the Bureau of Steam Engineering brought this failing of ours to the attention of Congress a little more than a month ago. Capt. Dyson said:

"I had in mind that when the Queen Elizabeth came out the English took all the credit of having turned out the first all oil fuel battleship, while the plans had been drawn and everything contracted for for the Oklahoma and Nevada before the Queen Elizabeth was thought of. But they got her in the water before we got our ship, and they claimed the first successful installation."

By dint of extraordinary work on the part of the bureau of construction and repair and the bureau of steam engineering plans for fifteen distinct types of vessels, authorized by Congress in the act approved August 29, 1916, were prepared in a very short time, and details of these craft have been familiar to the shipbuilders of this country for months. Not only that, but published data have been for sometime available to foreigners. The chief constructor in his last annual report said:

"In connection with the development of the designs of all of these vessels there was utilized to the utmost such information as was available in regard to naval developments attendant upon the progress of the European war."

Clearly, then, our potential rivals with their practical familiarity with battle cruisers, knowing that our own ships have been inspired by theirs and broadly acquainted with the particulars wherein our proposed craft differ, are in a very advantageous position to steal our thunder much as they did in the case of the Queen Elizabeth.

Within the past week the Secretary of the Navy has informed the Committe on Naval Affairs of the House of Representatives that the limit of cost for the first four of our battle cruisers will have to be increased about $2,500,000 apiece, which will bring the price for their hulls and machinery up to substantially $18,500,000 each. This figure, of course, does not include the cost of armor and armament, which will swell the total price of each of these great craft to $26,000,000. This is certainly a very large sum to pay for a fighting unit of the fleet if through delay in construction foreign navies are likely to surpass us.

As to the question of armor Admiral William S. Benson, chief of naval operations, made these significant remarks to Congress less than a year ago when the programme of naval increase was under consideration:

"There is one element, and that is even if we could build the hulls of these ships, the capacity of the country for heavy armor is about 28,000 tons a year, and, of course, that would be a controlling feature. * * * On a battle cruiser the armor, I do not think, would be more than five inches thick, and that would not interfere with the other 28,000 tons. I spoke of the heavy armor. * * * Possibly any quantity that we might want of the five inch armor could be manufactured. I think we could get enough to supply the number of battle cruisers that we might want."

The navy armor is principally for battleships. But it will be borne in mind that the output mentioned is based upon a three shift day, the armor plants working continuously night and day. It is therefore very doubtful whether the steel plants, with other demands for heavy forgings, &c., would be able to supply either the maximum volume of heavy armor for the United States navy or furnish enough of the lighter protective plating required for the battle cruisers. A large dreadnought calls for from 8,000 to 9,000 tons of armor.

The present Administration, urged on by Mr. Daniels, has recently authorized a Government armor plant, and private establishments will not, in the face of this Government competition, increase their own equipment, and unfortunately it will be many, many months before the Government factory will be ready for operation, and longer possibly before the material turned out by it will measure up to the Navy Department's exacting standards.

Last year Congress also authorized a Government projectile plant, and this has to do with a question affecting the ultimate fighting capacity of our battle craft. We have recently seen that a foreign bidder has offered to furnish armor piercing projectiles for the United States navy at a much lower figure than native concerns, and this has aroused the antagonism of domestic shell makers and provoked friction between them and the Navy Department.

The Government projectile plant will take a long time to build and equip and much experimenting will be required before the projectiles are satisfactory. Our heavy guns are likewise going to cost us a good deal more, and where $105,000 would pay for a 14 inch gun in 1915 the same weapon last year cost $115,000, even though Government made. In short, hesitation over increase of the navy in the past four years and the sudden awakening to our needs have brought us to a time when we have got to pay dearly for what we get, and we may not get what we want when badly needed.

As between the dreadnought and the battle cruiser the latter is undoubtedly the more novel craft and a fighting unit which our fleet to-day sadly lacks. So long as we are without ships of this sort and a foe is so provided the enemy can brush aside our strategic screen and rush in, locate and follow unhampered the movements of our dreadnought squadrons. On the other hand, without battle cruisers our scouting craft and destroyers could not break through the foe's screen and the enemy would have us strategically and tactically at a grave disadvantage.

We have had three striking illustrations of the parts that can be played by the battle cruiser in actual warfare, and yet while other navies have had them for years and are rapidly building more of them, the first of ours may not be begun for many months to come, and when started will probably not be launched for three years and not ready for service earlier than fifty-odd months hence. No matter what the cost, we should have these ships in record time, and certainly we should be able to come reasonably close to the building periods set by British constructors.

Of the six battle cruisers authorized by Congress last August the four now to be undertaken are vessels 850 feet long—nearly 100 feet longer than the Woolworth Building is tall—will have a beam of nearly 91 feet, and when fully equipped and ready for sea will have displacements of 34,800 tons. The first of our dreadnoughts, the Michigan, launched in May of 1908 and first commissioned early in 1910, has a displacement of but 16,000 tons. Therefore the battle cruisers will be more than two times as heavy as the pride of our fighting fleet seven years ago.

The battle cruisers will be able to make thirty-five knots an hour at full speed, or 40.3 statute miles, and their armaments will consist of ten 14 inch 50 calibre guns and eighteen 5 inch rapid fire guns, together with eight torpedo tubes, four above and four below water. The Michigan carries eight 12 inch 45 calibre guns and twenty-two 5 inch guns and is equipped with only two submerged torpedo tubes. The Michigan has a speed of a little less than nineteen knots an hour.

From an engineering point of view the battle cruisers are very unusual ships and, curiously, they have sprung propulsively from the collier Jupiter, a vessel of comparatively low speed and the first of our naval craft to be driven by electricity. The performances of the Jupiter led to kindred installations in some of our battleships now building and the battle cruisers are to be so propelled for the sake of general economy of working and because the electric drive adds immensely to the manœuvring facility, whether going ahead or astern. Speaking of the collier during a recent Congressional hearing, Capt. Dyson said:

"So far as repairs go and the receipt of complaints is concerned about the electric drive we do not know that the Jupiter is afloat, she causes so little trouble."

We have had a good deal of trouble with our turbine driven ships—those on which the turbines are linked up to the shafts by means of an intermediate mechanism, called a reduction gear. The reduction gear makes it possible for the high speeds of the turbine to be translated into lower propeller velocities, where the screws can work efficiently, but the turbine has its drawbacks when it comes to driving a ship sternward and a turbine works economically and to the best advantage only when operating at its highest speed.

Therefore turbines operating dynamos and running at full speed can produce current very efficiently and when current is thus fed to electric motors attached to the propeller shafts the screws can be worked ahead or astern at all speeds and under very favorable conditions. It seems that the electric drive is more economical in steam consumption than the reduction gear turbine for the battle cruisers at all stages below thirty knots, and at a speed of ten knots the electric drive will give a 12,000 knot cruising radius for about 600 tons less fuel oil than its mechanical competitor.

Above thirty knots—that is, at infrequent speeds—the reduction gear turbines have slightly the better of it economically. Electric drive upon a scale involving a development of 180,000 horse-power on four shafts is a courageous engineering departure, but the Government experts are satisfied that the adoption of the system is both wise and eminently practicable.

When the commerce destroyers Columbia and Minneapolis were designed in 1890 and 1891 the problem was how to distribute a total of 21,000 horse-power, then considered an amazing amount of propulsive energy to put in a single ship, Rear Admiral George W. Melville, engineer in chief, solved the difficulty by the adoption of three propellers—our experts did not dare risk 10,500 horse-power each on two shafts. How far we have moved along in this particular can be realized from the fact that each of the four shafts of each battle cruiser will transmit 45,000 horse-power.

To provide enough steam for this motive energy each battle cruiser will carry twenty-four water tube boilers, and these will be arranged on two decks. Twelve of these boilers will suffice to provide propulsive power for thirty knots, and the added five knots will call for the full steaming capacity of the other twelve boilers, illustrating how expensive is the gain in speed after thirty knots is reached.

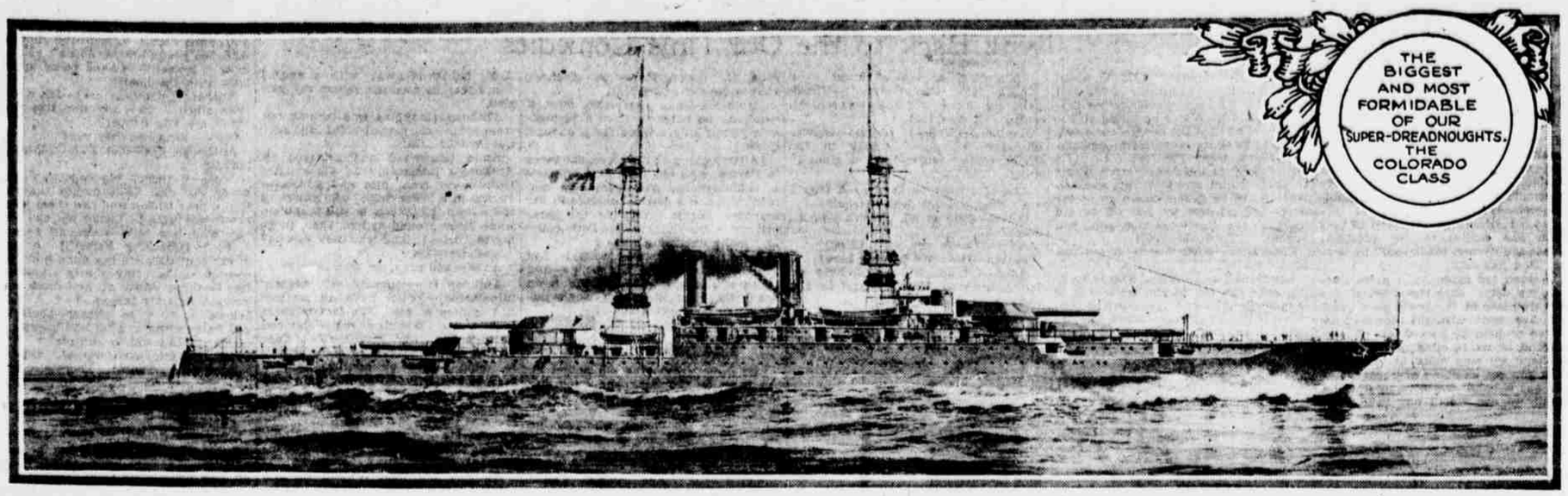
The boiler arrangement is unusual, and has apparently some defensive disadvantages, because the upper tier of boilers is more exposed to an enemy's gun fire. But the designers have found that this distribution withdraws all of the boilers further from the sides and bottom of the craft, and in the case of the lower tier protects them better from mine and torpedo attacks, which the present conflict has made plain constitute a very grave menace. The whole upper tier of boilers may be riddled or put out of commission by the foe's fire, and so long as the lower twelve steam generators are unimpaired the battle cruiser can make good her escape at thirty knots an hour.

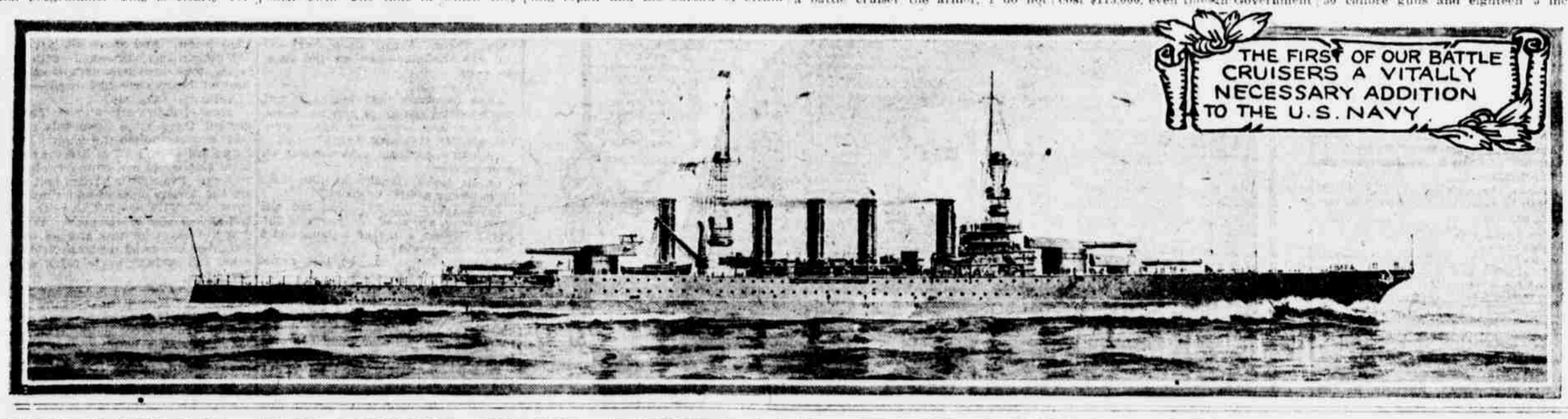
The four battleships of the Colorado class are very formidable vessels. They are 624 feet long over all, will have a speed of 21 knots and will be of 32,600 tons displacement. Their armor belts will be of Kruppized steel 14 inches thick, and their ponderous turrets will be protected by armor 18 inches thick.

Their primary armament will consist of eight 16 inch guns placed in four turrets, and the anti-torpedo craft defence will consist of twenty-two 5 inch rapid fire rifles. Each of the class will carry besides the foregoing weapons four 3 inch guns of our own anti-aircraft type. These ships potentially add greatly to the strength of our battle fleet, but the question is, When are we to get them?

Of the four scout cruisers to be undertaken at once Secretary Daniels has said: "They will be the largest and fastest vessels of this class ever laid down by any navy." They are to be of 7,100 tons displacement and 550 feet long and to make 35 knots an hour. Their main armament will consist of 6 inch rapid fire guns.

A contract for the construction of one of these vessels has been awarded. Bids for the building of two others were tendered on January 3, but the time of construction ranged from forty to forty-two months, and the price named was in excess of that allowed except for much speedier construction. No bid at all has been received by the Navy Department for the building of the fourth of these scout cruisers.





SEEKING TO FIX THE NORMAL DURATION OF HUMAN LIFE

Some Reasons for Believing That the Natural Span of Man's Life Is Ninety Years—Importance of the Period of Development

By I. L. NASCHER, M. D.

"THE days of our years are three score years and ten" (Psalms xc., 10). So spoke the Psalmist. "And the Lord said, My Spirit shall not always strive with man for that he also is flesh, yet his days shall be 120 years." Theology has never been able to harmonize these two passages in the Bible and science has never attempted it. The scientific investigator accepts nothing on faith; he wants facts. They may not always be demonstrable facts; indeed some of the best known facts connected with the sciences are derived from deduction, from analogy and from study room computation. Yet it is a curious indictment of science that while it can measure the distance from the earth to the stars, the age of a geological period and the size of a germ, it has not been able to estimate the duration of the most familiar phenomenon in nature, the life of the human species.

Naturalists have given formulas by which the length of life of a species might be estimated, but no formula so far elaborated applies to the human species. Buffon, Haller, Flouron and others used as their formulas multiples of the length of time required to complete development or growth or ossification of bones. All made the same mistake when they applied their figures to the human being; they fixed the period of development at about twenty years.

It is true that growth in height ceases about the twentieth year, but in every other direction the body continues to grow until about the thirtieth year. We need a larger hat, larger shoes, larger gloves, a larger collar, a wider coat at 30 than we did at 20. The only reason that growth in height ceases about the twentieth year is that the human being is an erect animal and in this position the constant downward pressure throws the spinal column into curves which in time overcome the increase in height.

This downward pressure also compresses the cartilages between the separate vertebræ. Persons who have been bedridden for years grow in length until the thirtieth year and it is a well known trick for persons who want to pass an examination and lack a quarter or half an inch in height to lie in bed for twenty-four hours or more before being measured. It gives the compressed cartilages a chance to expand and the spinal column becomes longer.

Since skeletal growth continues in every other direction until the thirtieth year it is assumed that if man were still a quadruped, freed from this downward pressure he would increase in height or length just as long as he increases in other directions. Not alone the skeleton but the vital organs continue to grow until about the thirtieth year.

About this time the heart has reached its maximal normal growth, the lungs have reached their maximal respiratory capacity and the brain is heaviest. At this time the cells of the body and the organs which they form are most active; the body is in its most perfect physical condition. The period of development is thirty years, not twenty years as naturalists have assumed when trying to make their formulas applicable to human life.

Following the period of development comes the period of maturity. In forming an estimate of the length of this period we must take into consideration three factors, the feelings of the individual, his looks and the condition of the organs. As these vary greatly in individuals of the same age we must take as our models those who as a class possess the physical capacity to complete the normal cycle of life and who live rationally, avoiding those factors which tend to shorten life.

The factors which are conducive to longevity are a dust free atmosphere; fresh food, the time of feeding and the amount of food being determined by the sense of hunger and not by the taste of the dishes; prompt attention to the call for the elimination of waste; activity gauged by the physical and mental capacity, stopping the moment fatigue sets in; sleep regulated by the needs of the body and not by the clock; recreation on the principle that the recreation should be the antithesis of the work that requires it, and the avoidance of mental depression.

These factors prevail to the greatest extent in the peasant class, and in this class do we find the largest number of persons who complete the normal cycle of life. We also find in this class a remarkable similarity in the character and extent of senile changes at the same age.

Taking this class as our basis for estimating the normal duration of the period of maturity, we find that until about the sixtieth year they neither notice nor show any marked evidences of aging. There are physical signs which the physician can detect long before the sixtieth year. The average weight of the brain is less at forty than at thirty, the respiratory capacity of the lungs begins to diminish soon after it has reached its maximum, and as there is a progressive hardening of the blood vessels the heart must work harder to send the blood through the circulation. But the functions of the organs are performed harmoniously until about the sixtieth year, when the first signs of aging are felt and seen.

During this period the body waste and repair counterbalance each other, but some of the repair material is of a different character from the tissue which has been used up. The tissue cells at the time of complete development are in their most perfect state, but later generations of cells depart from this perfect state, while there is an increase in the growth of other tissue cells less well adapted to perform the functions of the original tissues.

As muscle cells waste poorer muscle cells are reproduced and at the same time there is an increase in the growth of fibrous tissue cells, some of which replace the wasted muscle cells. It is the same as the degeneration of a neighborhood when the old families gradually die out and poorer people move in.

In some localities the waste of muscle cells is replaced by fibrous tissue cells, in some locations fat cells move in, in some localities the waste is not replaced at all. Cartilage cells may in like manner be replaced by bone cells.

But in the aging peasant these changes proceed very slowly and uniformly and not until he is about sixty does he notice any difference in his feelings. This is the general observation among this class, and basing our estimate upon such observation the normal duration of the period of maturity is about thirty years.

Along about the sixtieth year the peasant finds that he cannot do as much work as formerly, he gets tired and feels stiff after a few hours work, he gets out of breath and has palpitation of the heart upon exertion, he isn't as ambitious as he was formerly, he needs glasses and if he reads a short time or is engaged in any exciting pastime he becomes sleepy. If intelligent and observing he will notice diminished interest in every day affairs, a gradual weakening of his mental and physical powers. He has entered the period of decline.

Considered from the purely medical side there is a progressive waste of tissue, the waste being partly repaired by a lower grade of tissue; the heart becomes weaker and the circulation poorer; the organs and tissues consequently are not properly nourished and their functions diminish. The senses become slowly impaired and there is a gradual loss of strength, less work can be done and longer periods of rest and sleep are required. As the mind becomes weaker stronger sensations are required to produce an impression upon it.

When the teeth fall out the old peasant does not get artificial teeth, but he avoids those things that must be masticated and still later he goes back to the food of his childhood, mush and milk, and perhaps a little wine if his system has become habituated to it. Thus there is a slow progressive degeneration of all the organs and tissues and the consequent impairment of their functions, the heart getting weaker and weaker until finally the old pump can no longer force sufficient blood to the brain and nerves to keep them active. The brain becomes a blank, nervous control over the respiratory function is lost and respiration ceases and the heart stops in death.

Such is physiological death or death from old age.

Based upon such observation the period of decline lasts about as long as the preceding periods, making the whole duration of life about ninety years. It is true that some exceed this period even by a score or more of years, but close investigation into the records of reputed centenarians has shown that very few had really reached the age of 100.

The celebrated case of Noah Raby, who died in Piscataway, N. J., almshouse a few years ago at the reputed age of 132 years, was investigated by the Census Bureau, and it was shown that Raby was in fact less than 95 years of age when he died. The few proved centenarians are in a class by themselves; they are freaks of nature, comparable to giants in growth.

The estimate of ninety years has a substantial basis, as appears by the natural climacterics or critical periods in life. These critical periods give a stage of childhood and youth in the period of development, early manhood and womanhood and middle age in the period of maturity and old age and senility in the period of decline, each stage lasting about fifteen years.

In estimating the normal duration of life from observation we must omit from consideration those instances of extraordinary longevity for which we can find no other explanation than the possession of an exceptional tendency to develop, mature and decay slowly. There has been nothing in their lives so far as research can discover that has enabled them to live longer than the normal period; and like the giants in growth for whose exceptional height we can give no explanation we must assume that there was an abnormal inherent tendency of the individual.

There are, however, racial as well as individual tendencies which hasten or retard the normal cycle. The women of India develop early and age early, while the women of southern Russia develop late, age late and many complete and some exceed the normal duration.

That few persons complete the normal cycle in most countries is due in a large proportion of cases to avoidable causes. But to avoid all the causes that hasten the normal cycle and produce early aging, and the causes that suddenly break the cycle through disease and death from disease, an impracticable revolution in our mode of living would be necessary. It is impracticable, but not impossible, as is proved by those who exceed the Psalmist's threescore and ten by the additional score or more of years which the scientists say is their due.