increased circulation of air is secured for the system. But a Russian physiologist, Prof. Dogiel, of Kazan, whose monograph I have lately received through the politeness of Minister White, has made the most important discovery that man and animals have a decided rise of the blood pressure in the capillaries under the influence of music. The capillaries are expanded, the blood flows more freely, nutrition and heat are increased. The heart's action is also increased agreeably. Of course, to do this the nerve force also must be increased.

This may explain why the drumsticks gave our aged clergyman relief when the heart was laboring and disturbed. It indicates also that music is a medicine for diseases of fatty degeneration, because it removes the causal, impeded and sluggish circulation. It seems also right to infer that those who hear or perform music of the proper kind (for bad music is capable of producing very bad effects on the nervous system, as shown by the distress which young Mozart was once thrown into by the sudden and unexpected performance of what was called music from some uncouth instrument) will promote longevity, simply because it is less work to run the system. Athletes claim that their exercises promote the circulation. No doubt; but athleticism in the strictest sense requires such an expenditure of vital force or dynamics that it overdevelops muscles at the expense of other organs—brain, for example. Sudden and premature deaths are common, and athletes are notoriously short-lived. Life is a question of expenditure of nerve force. If this is lavishly and uselessly used or expended on one system, the muscular, for example, the other systems suffer, and life will cease sooner from this waste of force. But music makes nerve force, and saves it also by making the system run more smoothly; hence, other things being equal, music is as important in our colleges as athletic training, if longevity is what is required. To be sure, in the words of the old song, "We must have air and exercise to live and thrive and grow." But music is a charming exercise, which can be used long after athletics have ceased to excite any interest. Old people enjoy music when they could not engage in athletics. For example, Mrs. Mary Monroe, of Morrisania, N. Y., was ninety-eight years old last February, when she received the guests who honored her birthday reception until midnight! We must admit this was a considerable feat of endurance for one so old. Still her soul goes out to music. Within a year she was in the habit of attending church and partaking of the communion. I met her there and she said, "I like to go to church because I love to hear the music."

Mrs. Rebecca Whittemore, my maternal grandmother, died at the age of ninety-seven years and eight months. Save deafness, her faculties were clear and good. She personally entertained and received guests; presided at her table, pouring out tea and coffee daily until three days of her death. She was extremely fond of violin music. Never have I seen a person express more pleasure than she did a year or two before her death, when her great-grandson, Mr. B. Cutter, a professional violinist, performed the music of her youth.

My great aunt, Mrs. Harriet Foster, of Manchester, N. H., at the age of eighty-four played the piano and sang songs to me. She found her music a great solace in her old age. And well it might, since we have learned how it expands the capillaries, makes the blood flow more freely, and thus retards the fatty degeneration of decline.

MUSIC AND CONSUMPTION.

There is not time to give the details of cases where people supposed and pronounced to be in consumption have recovered under vocal culture in speech and song, and playing wind instruments. As a general rule, the expansion of the lungs prevents the development of tubercle. The view I take of consumption is that it comes through the food fermenting in the alimentary canal in which the bacillus of the vinegar yeast is developed.

If, for certain reasons which are not well understood, the disease can be kept there, chronic diarrhoea or consumption of the bowels follows. But if the vinegar yeast escapes into the blood it is quite sure to be arrested in the capillaries of the lungs, especially when contracted by the influence of cold on the surface of the body. The lung tissues are very elastic and spongy and contractile. The fact that vinegar yeast may be found in the blood of a consumptive generally for the space of one year before the lungs break down gives time for the victim to escape if the lungs are kept fully expanded so that the circulation is not impeded, and tubercle has no chance to form because the bacilli are not caught, engaged, or held in the capillaries. Now if such patients could have gentle vocal musical culture, which expands the lungs, they stand a good chance to escape the development of tubercle. Again, even when deposited, tubercle may and has been rendered harmless by the use of wind instruments and vocal culture. There are cases to prove this, and music certainly here is a means of longevity. Should this idea become generally known and adopted, our conservatories and teachers will find a fine field of medical effort in departments specially adapted to those threatened with consumption.

The American *MATERIA MEDICA* has already included music as a medicine. In London a guild has been formed for this purpose called the St. Cecilia's, whereby music is furnished to hospitals and individuals. I have seen, as you have, probably, the marvelous reports as to the efficacy of music in surgery and so on. I have not been able to verify these, but hope, through English correspondents, to know just what has been done.

BRONCHITIS AND PNEUMONIA.

In these complaints there is always a congestion of the capillaries. I can conceive how any one who feels the first signs of chill and constriction in the chest might about the beginnings of these complaints by vocal music. I have myself, when I felt chilled along with constriction in chest, by expanding the lungs with song or holding the breath, had the extremities become warm, the bad feelings removed, and no bronchitis or pneumonia followed.

I have known cramp of the legs to be arrested by a song, and severe disturbance of the bowels dissipated by music.

I do not wish to press this matter too far, nor to claim that music alone will produce longevity. Life is a warp and woof of many causes, but I do believe that if musical people would live rightly as to food, clothing, exercise, and temperance, they would have more longevity than now. Carl Formes, the basso, has died at an advanced age in California within two years. Up to that time he was in the full exercise of his teaching powers the livelong day.

LONGEVITY OF MUSIC.

This subject would not be complete without some reference to the facts in sacred history, that "the morning stars sang together, and all the sons of God shouted for joy" at the creation; that 6,000 years ago Jubal was "the father of all such as handle the harp and organ," and people of those days lived to 800 and 969 years; that about 3,300 years ago Moses and the children of Israel sang—Moses, who lived to be 120 years old, the greatest lawgiver and judge. He shows that the highest judicial qualifications did not prevent him from being a singer and poet. That David, the slayer, with his hands, of a lion and a bear, and with his sling, of the giant Goliath—David the king, the greatest poet, harper, and musician of the best class; that Jesus Christ sang; that music is in Heaven, the dwelling place of the immortal blessed, who, in the words of Payson, "Pour forth songs of praise as unceasing as the displays of those glories which excite them; or, in words of Dr. Beaumont, 'Heaven is a sanctuary . . . where hymns of praise, hallelujahs of salvation and hosannas of redemption, uttered by blessed voices without number, ever sound before the throne.'"

These allusions are made as some of you are directors of sacred music, and I would like you to feel that your part is of equal import and longer lived than any other of the exercises of worship. Some of our church music is taken from the tabernacle service before Solomon's time. For example, the music to "O! Sacred Head Now Wounded." Again, I have heard sung the music that Miriam sang with her brother Moses at the crossing of the Red Sea, and the lamentations of Jeremiah sung as they were first written, as was assured by good authority. Sacred music is the mother of all other music. Besides, we have seen, it is to last through eternity. It is with peculiar honor, significance, and propriety that a musical director was lately ordained in a Congregationalist church in Hartford, Conn. It was a fit recognition of the divine longevity of music.

To conclude, so long as music is so closely connected with longevity, objectively and subjectively, musical directors should magnify their high calling and see to it that but the best is offered in sacred worship. Lame and sick music—"Offer it now to thy governor. Will he be pleased with thee or accept thy person?" Remember that good music in public worship not only brings nearer to God, but, by improving the circulation of nerve force, air, and blood, directly promotes longevity, has cured insanity, and increased the sum of human happiness on earth, and is found in heaven.

ON POISONING FROM CANNED FISH.

By Dr. A. B. GRIFFITHS, F.R.S. Edin., etc.

THE poisonous ptomaines, formed from albuminoids during the decomposition of food, produce symptoms of poisoning, etc., which are said to be referable to the digestive and nervous systems. These symptoms manifest themselves at periods varying from a few hours to several days after eating food. The symptoms produced by this class of ptomaines are the following, among others: Unpleasant taste in the mouth, headache, vomiting, diarrhoea, salivation, dyspnoea, paralysis, and death. Several ptomaines render the heart's beats slow and weak, and in some cases of poisoning by unwholesome fish, the symptoms resemble those of poisoning by atropine.

Poisoning by unwholesome foods too frequently escapes notice; nevertheless every analyst or medical man who is careful of his scientific dignity should possess a thorough knowledge of the properties of the ptomaines, which have now quite a literature of their own.

Numerous deaths have occurred in England (see Griffiths in *Chemical News*, vol. lxii., p. 17; and the reports in *Daily Graphic*, November 25, 1892; *Daily News*, November 23, 1892, and April 22, 1893), on the Continent and in America, from eating unwholesome foods; and it has been shown that the poisonous properties of such foods are due to the action of microbes on the proteids contained in the foods. It may be stated that these poisonous properties are due to certain ptomaines or animal alkaloids. The ptomaines are produced during the putrefaction or decomposition of animal substances. By the direct action of microbes, the proteids are disintegrated, with the formation of ptomaines among other products. It will be seen, from this remark, that the ptomaines are not secreted or excreted by microbes, for they are the *residua* after microbial action. To explain the action of microbes on organic matter generally: Let a, b, c, d represent the composition of the medium in which certain microbes live, and let a', b', c', d' represent the food extracted from such a medium by the microbes for their nourishment; it therefore follows that a, b, c, d will represent the residue or the products of the microbial action—be it fermentation, nitrification, the production of ptomaines, etc.

It should also be borne in mind that the idea of ptomaines *without* microbes is inconsistent with an impartial study of facts. It is true that a suitable filtration (e. g., through porous porcelain) will separate a ptomaine from its microbe; but when this microbe is separated from the original liquid and transferred successively to nourishing media, so as to purify it from every foreign element, it continues to produce its characteristic ptomaine (or ptomaines), which is produced at the expense of the culture fluid. There is no true ptomaine without microbes, any more than there is ergotine without *Claviceps purpurea*, vinegar without *Bacterium aceti*, or alcohol without certain species of the *Saccharomycetes*.

Such are our preliminary remarks concerning the ptomaines; we now proceed to describe a new ptomaine which we have extracted, from *putrid sardines*, by the following process:

The putrid mass was boiled with water, filtered, and the filtrate precipitated with subacetate of lead. This precipitate was filtered off, a current of H_2S passed through the filtrate, and the plumbic sulphide separated by filtration. The filtrate was concentrated by evaporation and then extracted with amyl alcohol. The amyl solution was repeatedly treated with water, then concentrated, acidulated with H_2SO_4 , and repeatedly shaken with ether, which removes the oxy-aromatic acids. Freed from ether, it was evaporated to a quarter of its volume, and thus volatile fatty acids were driven off. The H_2SO_4 was precipitated by baryta, and the precipitate removed by filtration. The excess of baryta was precipitated by a current of CO_2 , and this was also removed by filtration. The fluid was heated for some time on a water bath, cooled, and precipitated with $HgCl_2$. The precipitate was washed and decomposed with H_2S ; the mercuric sulphide was filtered off, and the filtrate concentrated. The hydrochloride of the ptomaine was subsequently deposited in the crystalline condition. It was dissolved in water, and then treated with pure calcium hydroxide, which liberated the base. The ptomaine was separated by chloroform, in which it is soluble; and it was finally purified by washing with alcohol and water.

This new ptomaine is a white crystalline substance, soluble in water, and has a slight alkaline reaction. It is precipitated by hydrochloric acid in the form of a white crystalline hydrochloride. Platinic and auric chlorides precipitate this ptomaine, and the resulting platino-chloride and aurochloride are yellow crystalline compounds. This base produces with phosphomolybdic acid a greenish precipitate, with phosphotungstic acid a yellowish white precipitate, and with picric acid a yellow one. It is also precipitated by silver nitrate and Nessler's reagent. Analyses of this base gave the following results:

0.378 gramme of substance gave 0.9669 gramme of CO_2 and 0.2034 gramme of H_2O .

0.2213 gramme of substance gave 14.1 c. c. of N.

	Found.	Calculated
	I.	II. $C_{11}H_{11}NO_2$
Carbon	69.77	69.84
Hydrogen	5.98	5.82
Nitrogen	—	7.45
Oxygen	—	16.94

The above figures correspond with the formula:

for this new ptomaine.

This base, which has been named *sardinine*, is poisonous—producing vomiting, diarrhoea, and death; and there is little doubt that it is the cause of the poisoning which results from eating putrid sardines or sardines which have been badly tinned.

It may be useful to give a list of the ptomaines which have been extracted from the products of bacterial putrefaction of certain fishes, etc.:

- (1) Parvoline, $C_8H_{13}N$, from mackerel (Gautier and Etard).
- (2) Hydrocollidine, $C_8H_{13}N$, from mackerel (Gautier and Etard).
- (3) Scombrine, $C_{11}H_{15}N$, from mackerel (Gautier and Etard).
- (4) Muscarine, $C_6H_{13}NO_2$ (Brieger).
- (5) Gadinine, $C_7H_{14}NO_2$, from cod (Brieger).
- (6) Ethylenediamine, $C_2H_8O_2$, from cod (Brieger).
- (7) Mytilotoxine, $C_8H_{15}NO_2$, from mussels (Brieger).
- (8) Sardinine, $C_{11}H_{11}NO_2$, from sardines (Griffiths).
- (9) Collidine, $C_8H_{11}N$, from cuttle fish (De Coninck).
- (10) Coridine, $C_{10}H_{15}N$, from cuttle fish (De Coninck).

In addition to "fish poisons," it may be mentioned, *en passant*, that Lewis (*Chemical News*, vol. lxvii., p. 52) believes that the twenty cases of poisoning in America, which resulted from eating tinned beef (in 1892), were due to neuridine ($C_8H_{15}N_2$); and the poisoning which sometimes results from eating unwholesome cheese, ice cream, etc., has been proved to be due to a ptomaine which is named tyrotoxinon ($C_8H_{15}N_2$) by Vaughan.

In conclusion, there is no doubt that the ptomaines play an important part in most cases of poisoning from eating unwholesome food, and it is of primary importance that analysts, medical men, and others should make themselves thoroughly familiar with the properties of these curious products of putrefaction.

ELECTRICAL AND LIGHT VIBRATIONS.

At a recent meeting of the Physical Society, Berlin, Prof. Von Helmholtz, president, in the chair, Dr. Rubens gave an account of experiments he had made, together with Dr. Du Bois, on the permeability of metallic wire gratings to polarized heat rays. As is well known, Hertz's experiments on electric oscillations brought them into close relationship to the properties of light vibrations, as shown by reflection, refraction, and polarization. The fact that metallic gratings act as polarizers toward electric waves, inasmuch as the waves can only pass through when the wires of the grating are parallel to them, has no analogue in the case of light, since linearly polarized light can pass through a grating whatever be its position. On the assumption that this difference is dependent simply on the fact that light waves are too small for the gratings employed, the authors had experimented with the longer heat rays and gratings of extremely narrow aperture. The latter were made of the finest wire (gold, silver, copper, and iron), the intervals between the wires being 0.0025 mm., and the rays of a zirconium flame, up to $W. L. 6\mu$, were examined. The ocular of the spectroscope carried a very sensitive bolometer. It was found that with each of the gratings the ultraviolet rays behaved like electric waves; those rays which vibrated at right angles to the plane of polarization passed through a grating placed parallel to their plane, in threefold extent, as compared to the amount which passed when the grating was at right angles. This result was obtained with different metals with varying wave lengths of the rays, e. g., with silver by $W. L.$ above 2μ .

* Gadinine is non-poisonous.

† For further details concerning the ptomaines, see Griffiths' "Researches on Micro-Organisms" (alliere) and "Manual of Bacteriology" (Heinemann); and the case of poisoning from eating ice cream, reported in Birmingham *Daily Post*, September 22, 1892.