Alexander Wynter Blyth (1844-1921).

A pioneering and innovative Public Analyst

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Life and Times

Alexander Wynter Blyth, son of a medical practitioner of Woolwich (South East London) was born August 29th. 1844 [1, 2]. He was educated for the medical profession at King's College, London, where he showed his early interest in chemistry. He graduated in 1870 and the same year obtained Membership of the Royal College of Surgeons. Later, he studied law and was called to the Bar as a member of Lincoln's Inn. In 1878 he was appointed Public Analyst for Totnes, and subsequently for the County of Devon, in 1879 for Tiverton, and in 1882 Medical Officer of Health and Public Analyst for the London borough of St. Marylebone. He occupied the dual post at St. Marylebone for 30 years, then resigned the medical portion but remained their Public Analyst until his death, at the age of 76.

Figure 1

Portrait of Alexander Wynter Blyth taken from a lantern slide presented to the Society for Public Analysts by Dr. Bernard Dyer in 1935. Courtesy of the Library and Information Centre, Royal Society of Chemistry.

In the early days of the "Sale of Food and Drugs" Acts (1860, 1875, 1879, 1899-) the appointments of Medical Officer of Health and that of Public Analyst were frequently held by the same individual [3]. It was quite a common practice for medical men to spend a few months in the laboratory of a chemist to acquire some idea into the duties of what was then regarded as a subsidiary appointment. Under such conditions it is not surprising that many of the early medical Public Analysts were not competent chemists, that their results were often challenged and that few improvements in the methods of analysis originated with them. However some were essentially chemists who had taken medical qualifications to devote themselves to questions of public health, because at the time there was little opportunity for success in the practice of purely professional as opposed to academic chemistry. The Society of Public Analysts was founded in 1874 to support the work of Public Analysts [3] and soon after, in 1877, the Institute of Chemistry to raise professional standards, more generally, in applied chemistry [4]. In 1906 the Society of Public Analysts was incorporated as the Society of Public Analysts and other Analytical Chemists, indicating the increased width of its scope and activities.

Wynter Blyth was a man of great ability and untiring energy for in addition to his duties as Public Analyst he was a diligent and productive researcher, an influential text book author. In addition, he made time to serve many honorary positions connected with his professional interests. These include Presidency of the Incorporated Society of Medical Officers of Health, Registrar of the Royal Sanitary Institute, Council Member of the Institute of Chemistry (1891-1893, 1896-1898), Council Member (1877-1879, 1882-1883, 1886-1887 and 1897-1898) and Vice President (1880-1881, 1884-1885 and 1897-1898) of the Society of Public Analysts.

Wynter Blyth's Text Book Publications

a) Public Health

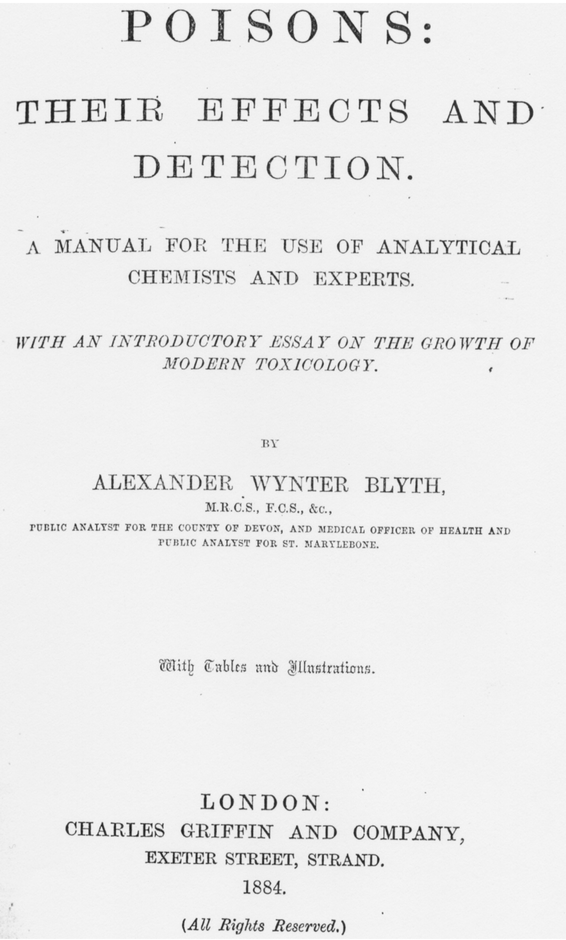
Wynter Blyth produced four texts in the area of public health, in early to mid career, namely,

1. “A Dictionary of Hygiène and Public Health….”, (1876) [5].
2. “Diet in Relation to Health”, (1884) [6].
3. “A Manual of Public Health”, (1890) [7].
4. “Lectures on Sanitary Law”, (1893) [8].

The “Dictionary of Hygiène….”, was illustrated by drawings of microscope images of foods by Atcherley [9]. In the later more specialized account of “Foods” [11] these images were replaced by a larger number made at higher magnification showing more structural details. The section in the “Dictionary of Hygiène..” on “the dietetic values of foods, and on the detection of adulterations” clearly laid the foundations for Wynter Blyth’s, “A Manual of Practical Chemistry: the analysis of foods and the detection of poisons” (1879) [10].

b) Analytical Chemistry

Wynter Blyth’s two most famous analytical texts, those on “Foods” [11] (see Figure 2) and on “Poisons” [12] (see Figure 3) were developed by revision and major expansion of his earlier “A Manual of Practical Chemistry:…” [10] to two volumes. Both volumes are extensively referenced to permit study, then and since, of the various methods developments; both are prefaced by extensive essays. In “Foods” on “The History of Adulteration” [13], in “Poisons” on “Old Poison-Lore” [14] and on “Growth and Development of the Modern Methods of Chemically Detecting Poisons”.


POISONS:

THEIR EFFECTS AND DETECTION.

A MANUAL FOR THE USE OF ANALYTICAL CHEMISTS AND EXPERTS.

WITH AN INTRODUCTORY ESSAY ON THE GROWTH OF MODERN TOXICOLOGY.

BY

ALEXANDER WYNTER BLYTH,

M.R.C.S., F.C.S., &c.,

PUBLIC ANALYST FOR THE COUNTY OF DEVON, AND MEDICAL OFFICER OF HEALTH AND PUBLIC ANALYST FOR ST. MARYLEBONE.

With Tables and Illustrations.

LONDON:
CHARLES GRIFFIN AND COMPANY,
EXETER STREET, STRAND.
1884.

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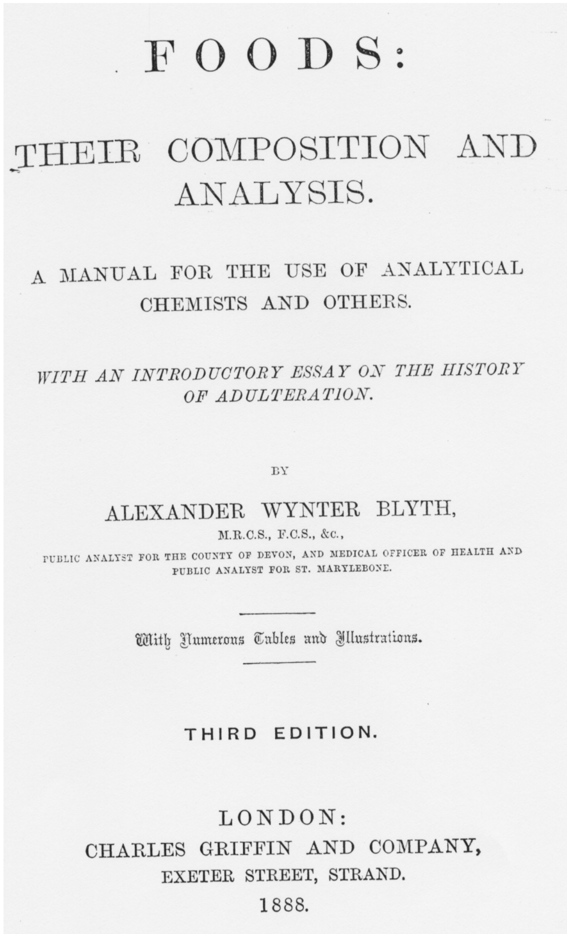
Figure 2

Title page “Poisons: Their Effects and Detection”, (1884)


FOODS:

THEIR COMPOSITION AND ANALYSIS.

A MANUAL FOR THE USE OF ANALYTICAL CHEMISTS AND OTHERS.

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With Numerous Tables and Illustrations.

THIRD EDITION.

LONDON:
CHARLES GRIFFIN AND COMPANY,
EXETER STREET, STRAND.
1888.

Figure 3

Title page “Foods: Their Composition and Analysis”, 3rd. edition, (1888)

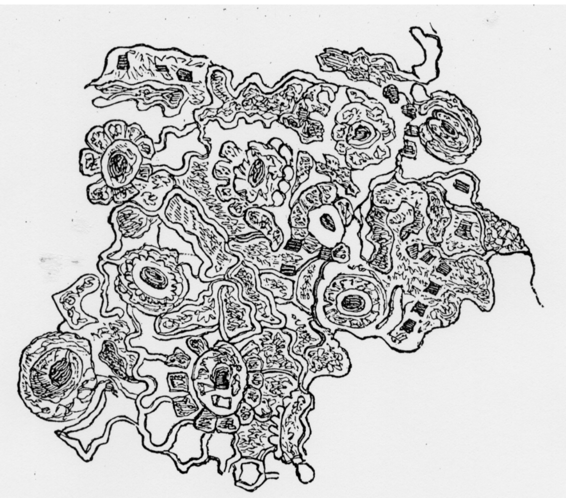
For both books he did a large amount of original chemical work in the investigation of new process or in attempts to improve older procedures. He was keenly interested in spectroscopic and microscopic procedures both for poisons and foods.

The various editions on "Poisons" were particularly important at the time prior to the formation of Police and dedicated forensic science laboratories in the United Kingdom when such analyses were then carried out by Public Analysts and by academic consulting chemists. "A Manual of Practical Chemistry.." [9] and "Poisons"[11] both contained items relevant to public health, some of which went unheeded. For example, in late 1900 the United Kingdom brewing world was startled by the occurrence of vast numbers of cases of arsenical poisoning in Lancashire and Staffordshire. The cause was ultimately traced to the consumption of beer that had been brewed, in part, from glucose manufactured using sulphuric acid derived from arsenical pyrites. Wynter Blyth in 1879 [9] had called attention to the possibility of just such an occurrence; sadly his warning had been overlooked [3].

All editions of "Foods" contain excellent drawings of microscope images of natural products such as pepper, various starch containing grains, adulterants for leaf tea etc (see Figure 4).

Figure 4

Microscope images [originally x 300] from "Foods" (1888)



Epidermis of under surface of the leaf of camellia sassanqua

Sloe leaf, possible adulterants for leaf tea

These drawings, used in all the editions, have not since been surpassed and are used, even today, by Public Analysts and their pupils. Both volumes were regularly revised and reprinted. "Foods", appeared in seven English editions and one American reprint, and "Poisons" in five editions, the last of these being just before his death whilst working on a new edition of "Foods" also with his son, Meredith Wynter Blyth, who was the Public Analyst for the Borough of Brighton and for the Borough of Eastbourne. The last Edition, the 7th., (1927) was that "revised and partly rewritten" by Henry Edward Cox, Public Analyst for the Metropolitan Borough of Hampstead.

Publications of Original Work

a) Public Health

Several of his many lectures on topics relevant to public health were published in journals, for example

1. "The contagion of cancer" (1887) [15].
2. "The desirability of uniformity in reports of medical officers of health" (1890) [16].
3. "The isolation of the infectious sick in hospitals" (1896) [17].

He also studied disinfectants by new methods [18], conducted experiments on the destruction of spores of Anthrax bacillus [19], and using a remarkable modern looking device (see Figure 5) for sampling waters at various depths (designed for him by S. L. Archer) the distribution and significance of micro-organisms in water [20].

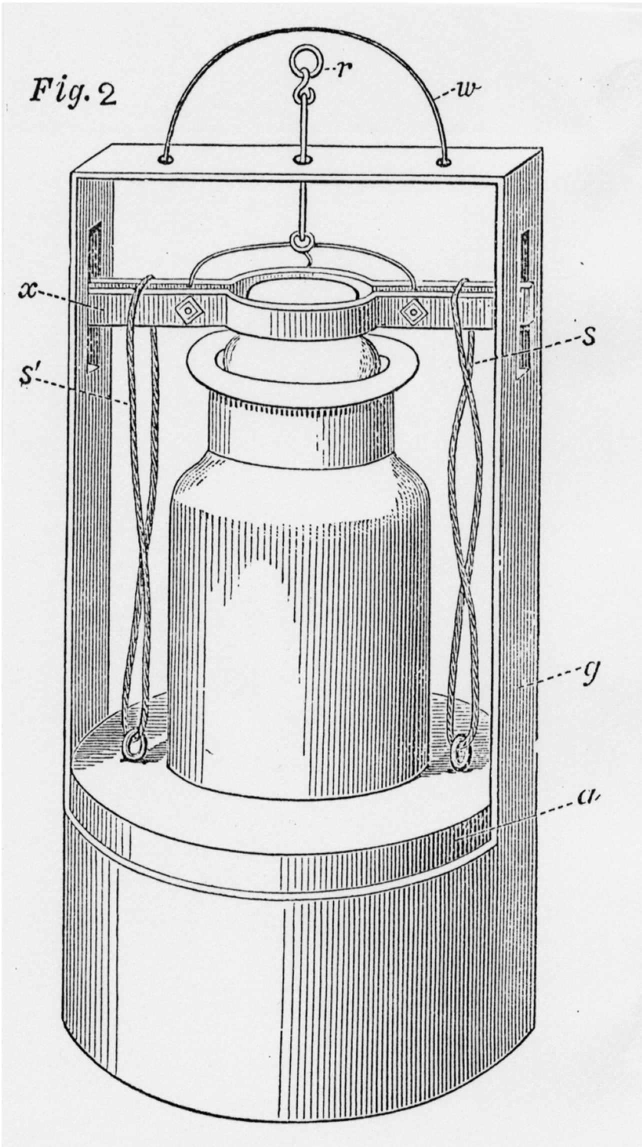


Figure 5

Device for sampling water at various depths

The work involved in the "Observations on the Ingesta and Egesta of Mr. Edward Payson Weston during his walk of 5,000 miles in 100 days" [21] would have been heroic both for the walker and for the analyst, in view of the nature and numbers of samples both consumed and produced.

b) Topics in Analytical Chemistry

Wynter Blyth's published work includes original, developments and comments on methods for a wide cross section of materials relevant to Public Analyst's practice from the late 19th. to early 20th. century. These include various poisons, tea, condiments, bread and flour, water and particularly milk. His methods were mainly chemical but he made some pioneering applications of instrumental procedures including optical microscopy, macro and micro sublimations, conductance measurements and UV spectroscopy.

Poisons

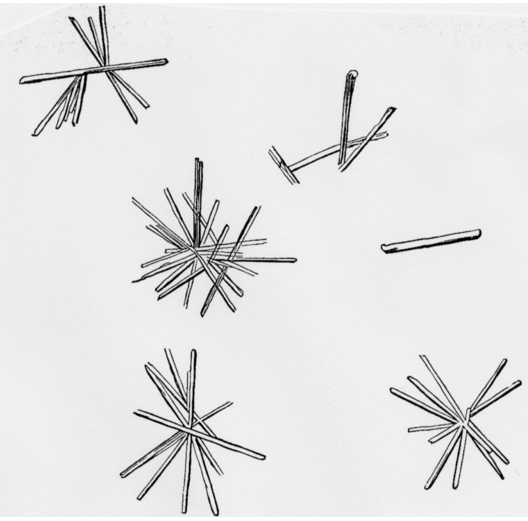


Figure 6

Cobric Acid magnified 250 Diameters

He was one of the earliest investigators of Cobra poison [22] and in 1878 received a Government Grant in aid of his research in view, at the time, of its being a significance cause of deaths in India and Ceylon. From the dried venom he isolated an active principal, named as cobric acid and examined the small crystals microscopically (see Figure 6).

A series of Alkaloids were identified via an improved apparatus for measuring their temperatures of sublimation[23].

Vegetable alkaloids in the correct doses may be used therapeutically, for example, quinine in wine. Wynter Blyth evaluated Mayer's reagent, Scheibler's reagent and the ether-alkali process for the estimation of quinine in wine and in tinctures. Using a new liquid handling system (see Figure 7) he found the latter method the best [24]. Wynter Blyth used the lead sulphate method to report on the "distribution of lead in the brains of two factory operatives dying suddenly" [25], later he described a delicate qualitative test for lead in drinking water, using cochineal which could also be applied quantitatively [26].

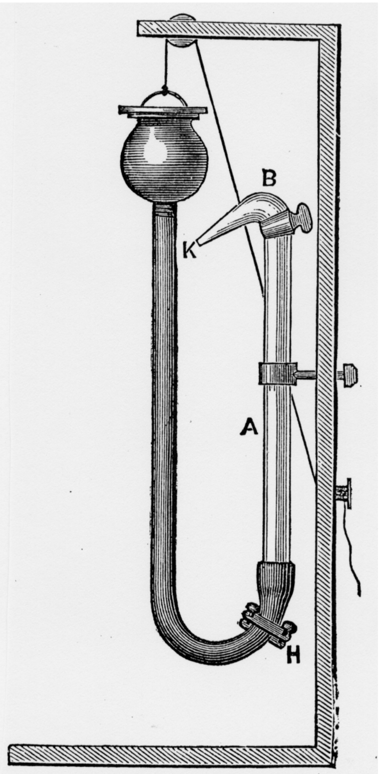


Figure 7

Wynter Blyth's tube for the treatment of liquids by volatile solvents (Ref. 24)

Tea

To accumulate evidence on genuine articles of food Wynter Blyth obtained and reported on the % extractives, ash and tannin of a sample of genuine pure leaf tea grown by his brother-in-law in India [27]. He then developed an apparatus for the microchemical sublimation in the presence of calcined magnesia to isolate theine, in order to identify plant material as from a "Theine producing plant". In view of the ease of sublimation of theine he then worked out a macroscopic quantitative variant of the procedure [28].

Pepper

Chemical studies (percentage soluble and insoluble ash, water and alcohol extractives, nitrogen content) of pure samples of commercially available peppers (*piper nigrum*) of differing origins were studied to ascertain their variability in order to assist with the examination of material suspected of adulteration [29, 30] and the preparation, and possible adulterants, were discussed [30, 31].

Flour and Bread

At a meeting of the Society for Public Analysts, March 1878, Wynter Blyth drew attention of his "brother analysts" to the advisability of making separate analyses of the crumb and crust of bread. He had found a small percentage of alum in the crust of certain bread and only the usual minute quantity in the crumb. He understood from the trade that bakers use strongly alumed flour, technically called "cones", to face the loaves [32].

Having found the logwood test applied to bread or flour wanting in both delicacy and sharpness he sought to improve it. Knowing that gelatine united with alum he attempted to utilize this property. A slip of gelatine was soaked 12 hours in a solution containing alum and then dyed by tincture of logwood and the slips placed in glycerine, the brownish-yellow reagent diffused leaving a distinct blue tint. The colourations were found to be stable for at least one month. A series of natural dyes was examined; none equaled logwood for its delicacy of reaction and depth of colour. On prolonged soaking in water or in hydrochloric acid, alum could be readily detected in flour or bread. The paper in the "Analyst" was illustrated with a lithograph showing the shades from lavender blue up to cobalt for gelatine dyed with logwood for alum in water at concentrations of 1:10,000; 1:7,000 and 1: 1,000 [33]. Results for the analysis of bread by this test brought him into a difference of opinion with the Inland Revenue, Somerset House laboratory, sufficient for him to propose amendment of the "Sale of Food and Drugs Act" with regard to referee analyses. He was of the opinion that the then Court of Appeal for disputed analyses, Somerset House, was in the highest degree unsatisfactory as it was, in nine cases out of ten, a reference from a higher to a lower authority. "For example, if Dr. Dupré {President of the Society for Public Analysts, 1877 and 1878}, whose experience in the analysis of wine is very great, should certify to the sophistication of a given sample, his decision is liable to be reversed by chemists, who have never by publication, or in any other manner, proved that they possess any special practice in, or knowledge of, that particular subject" [34]. The proposal was not adopted.

Wynter Blyth reported that his modification of the determination of nitrogen in organic materials by moist oxidation with permanganate in strong sulphuric acid, followed by addition of alkali and distillation of ammonia into standardised acid and back titration of the excess, developed earlier for the determination of total nitrogen in a pedestrian's urine [21], could also be applied to flour and farinaceous foods, malt extracts, cocoa, tea, coffee and water [35].

SOCIETY OF PUBLIC ANALYSTS.

Analyses of English Public Water Supplies in January, 1881. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine.	Phosphoric Acid.	Nitrogen as Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Total Solid Matter, dried a 220° Fahr.	Microscopical Examination of Deposit.	Analysts.
								2 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	pale blue	slight	1·35	none	·3000	·0009	·0033	·0040	·0100	16·8°	3·8°	20·05	sand, vegetable debris	Wigner & Harland.
New River	c., faintly tinted	none	·84	traces	·2930	·0020	·0010	·0020	·0370	14·4°	4·1°	23·80	none	B. Dyer.
East London	greenish	none	1·35	h. traces	·0800	·0055	·0117	·0100	·0700	16·0°	7·4°	23·45	sand, vegetable debris	Wigner & Harland.
Southwark & Vauxhall	pale yellow	none	1.24	traces	·1690	·0005	·0050	·0020	·0440	17·5°	5·0°	23·80	satisfactory	J. Muter.
West Middlesex	c. yellow	none	1·09	traces	·2600	·0013	·0060	·0050	·0860	18·0°	4·6°	23·44	Amorphous organic matter	O. Hehner.
Grand Junction	f. yellow	none	1·12	traces	·1254	·0011	·0053	·0038	·0488	15·1°	4·0°	21·80	none	A. Wynter-Blyth.
Lambeth	marked yellow	slight	·96	traces	·1570	·0007	·0070	·0047	·1250	17·0°	4·8°	24·50	veget. debris, moving organisms	J. Muter.
Chelsea	greenish yellow	none	·95	h. traces	·1460	·0010	·0062	·0056	·0700	16·5°	7·5°	23·24	none	A. Dupré.
Birmingham	f. yellow	none	·98	traces	·1610	·0020		·0080	·0360	13·9°	7·1°	22·60	none	A. Hill.
Bradford	f. dirty yellow	none	·75	none	none	none	·0070	·0168	·1400	4·2°	3·7°	7·80	none	F. M. Rimmington.
Cambridge	faint blue	none	1·57	h. traces	·4030	·0007	·0021	·0039	·0616	18·5°	6·0°	24·50	none	J. West-Knights.
Canterbury	clear blue	none	1·47	none	·3460	·0006	·0008	·0040	·0080	7·0°	4·0°	10·64	traces mineral	S. Harvey.
Croydon	f. green	earthy	1·12	traces	traces	·0100	·0110	none	·0300	15·0°	8·0°	23·80	none	C. Heisch.
Derby	v. good	none	·99	none	·1100	·0031	·0131	·0080	·0420	10·3°	3·8°	21·00	trace veg. matter	Wigner & Harland.
Exeter	f. yellow	none	·84	traces	·2300	·0007	·0045	none	·0343	2·8°	2·8°	7·00	none	F. P. Perkins.
Grantham	greenish blue	none	1·12	traces	·7220	·0010	·0025	none	·0140	16·7°	5·5°	23·13	none	A. Ashby.
Huddersfield	brownish yellow	rain w.	·50	traces	·0080	·0070	·0060	·0020	·0195	2·1°	1·5°	4·60	none	G. Jarmain.
Hull	good	none	1·30	traces	·4100	·0005	·0021	·0015	·0050	16·0°	3·5°	22·80	none	J. Baynes.
King's Lynn	milky opaque	slight	1·55	h. traces	·3260	·0538	·0028	·0300	·0630	16·1°	5·3°	28·75	Amorphous organic matter	W. Johnstone.
Leamington	greenish	none	1·40	none	none	·0014	·0035	·0040	·0140	28·4°	17·5°	30·80	none	A. B. Hill.
Leeds	light brown	peaty	·62	traces	none	·0003	·0030	·0200	·1100	5·2°	2·9°	6·44	sand, peaty matter	T. Fairley.
Manchester	slightly turbid	peaty	·75	traces	none	·0025	·0040	·0053	·0516	1·9°	1·7°	4·75	none	W. Thomson.
Newcastle-on-Tyne	f. yellow	none	·88	traces	·0600	·0010	·0090	·0140	·0700	16·6°	5·0°	21·30	none	J. Pattinson.
Norwich	peaty	none	1·90	traces	traces	traces	·0072	·0100	·0680	17·0°	4·5°	22·80	none	W. G. Crook.
Oldham, Piethorn	dirty yellow opaque	slight	·71	v. h. traces	·0800	·0087	·0032	·0060	·0820	2·7°	2·0°	5·40	vegetable debris	Wigner & Harland.
Do. Strinesdale	yellowish opaque	slight	·71	v. h. traces	·1100	·0025	·0027	·0040	·0700	5·7°	5·0°	10·00	animal and vegetable debris	Wigner & Harland.
Salford	c. yellow	slight	·50	none	none	·0005	·0030	none	·0250	3·5°	3·0°	4·00	none	J. C. Bell.
Sevenoaks	colourless	none	1·22	traces	·2660	·0060	·0010	·0010	·0330	13·1°	3·8°	19·88	none	B. Dyer.
Sheffield	brownish turbid	none	·50	none	none	·0021	·0049	none	·0970	4·0°	4·0°	5·81	none	A. H. Allen.
Shrewsbury	colourless	none	1·26		·3700	·0020	·0040	none	·0070	22·8°	5·0°	27·60	none	T. B. Blunt.
Sunderland	pale blue	slight	1·99	traces	·2500	·0017	·0028	·0060	none	9·7°	3·8°	25·80	vegetable matter	Wigner & Harland.
Warwick	greenish yellow	slight	1·19	traces	·1540	·0028	·0049	·0080	·0530	21·0°	17·2°	21·00	none	A. B. Hill.

Figure 8

Table of Results of Analyses of English Public Water Supplies in January 1881 (See Reference 39)

Water

Wynter Blyth noted after analysing water collected at various points in a distribution system that organic matter disappeared after running a distance in closed pipes, a fact not generally known but of considerable importance to sanitary engineers and hygienists [36].

Discussion, following a paper in November 1880 by A. Dupré on water analysis [37], lead the Society for Public Analysts to set up a Committee to consider the whole matter of the analysis of water, with a view to bringing uniformity to the procedure, in the statement of results and the deductions based thereon. Wynter Blyth was one of the six original members appointed. Their work and discussions culminated in a scheme of water analysis set out in minute detail, a scheme which was followed for several decades by water analysts [38]. Members of the Society were then invited to send monthly, for record in the "Analyst", analyses, made in the prescribed form, of the water supplies in the districts in which they resided (see Figure 8). In this way a considerable mass of data was accumulated for the purposes of reference and comparison. These tabulated monthly statements continued up to the end of 1882 [39].

Milk and Dairy Products

Milk and dairy products, like water, received from Public Analysts both individual and corporate efforts to solve analytical problems and arrive at a consensus view of the characteristics of legally acceptable products under the "Sale of Food and Drugs Acts" (1860, 1875, 1879 and 1899-) and the "Adulteration Acts" (1866 and 1872).

In 1871 a milkman in Plymouth set a trap for Wynter Blyth by submitting to him a sample for analysis of "genuine" milk, practically destitute of cream. Correspondence published in the local paper, the "Western Morning News", concerning the matter was reprinted in the "Analyst" [40, 41]. As a result of this attempt, the Editorial Committee of the "Analyst" published comment, "Milk means whole milk, the entire produce derived from the cow" and also "that milk from a diseased cow is not of the "nature, substance or quality demanded" {a key phrase in the Food and Drugs Act} proper to be sold under the name of milk". They went on to state, "If, for the sake of profit a milkman half starves a cow till he produces disease, we hold that if he sells the milk of that cow as genuine milk, he is justly liable to conviction under the Act" [42]. Thereafter, Wynter Blyth made a particular study of the composition, preservation and chemistry of milk and dairy products.

Average Composition of Healthy Cows' Milk.

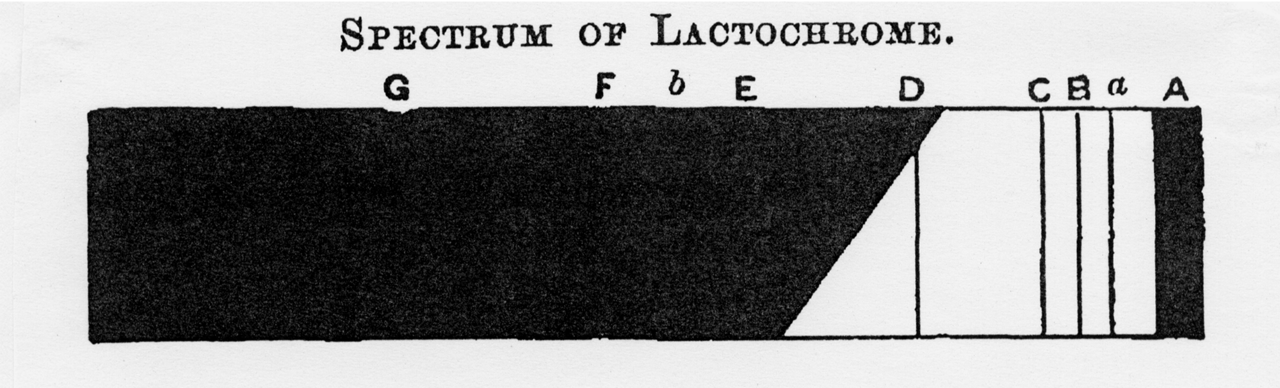
			Parts per cent. by weight.
Milk fat	Olein	1·477	3·50
	Stearin and Palmitin	1·750	
	Butyrin	0·270	
	Caproin, Caprylin and Rutin	0·003	
Casein			3·98
Albumin			0·77
Milk-sugar			4·00
Galactin			0·17
Lactochrome			undetermined
Bitter principle (glucoside ?)			0·01*
Urea			traces, such as ·0001 per cent. nearly always present.
Creatin			traces (Commaille).
Ash	K_2O	0·1228	0·700
	Na_2O	0·0868	
	CaO	0·1608	
	Fe_2O_3	0·0005	
	P_2O_5	0·1922	
	Cl	0·1146	
	MgO	0·0243	
Water			86·87

Figure 9

Blyth's Results for Average Composition for Healthy Cows' Milk (See Reference 44)

Wynter Blyth reported on the changes he had noted in composition with time of both milk and cheese; both topics of importance in view of the time delays possible in the transmission to, and analysis by, the Inland Revenue Chemists [43]. In his major paper on the composition of Cows' milk in Health and Disease [44] he gave details of no less than 18 components including the content of groupings of the fatty acids, the manipulation of which he had made a prior study [45] (see Figure 9).

This paper also records the first isolation of an alkaloidal colouring matter he called "lactochrome" (see Figure 10). This is now known as Vitamin B2. The full physiological and chemical characterisation of which formed part of the work on carotinoids and vitamins for which Richard Kuhn was awarded the Nobel Prize for Chemistry in 1938 [46]. Similarly detailed analyses were reported by Wynter Blyth for the composition of Devonshire Cream [47].



Spectrum of "Lactochrome". (See Reference 44)

Because the measurement of the specific gravity of butter is important in assessing if it is genuine Wynter Blyth described his procedure, which he said had no claim to originality, in detail [48]. He evaluated Clausnizer and Mayer's non-extractive method of estimation of fat in milk, from the specific gravity of the milk and the dried residue, and found it sufficiently accurate in a majority of cases for technical work [49]. Wynter Blyth was the first to notice the curious patterns which are obtained by dropping a fat in fluid state on to water, or on to a smooth wet surface (see Figure 11).

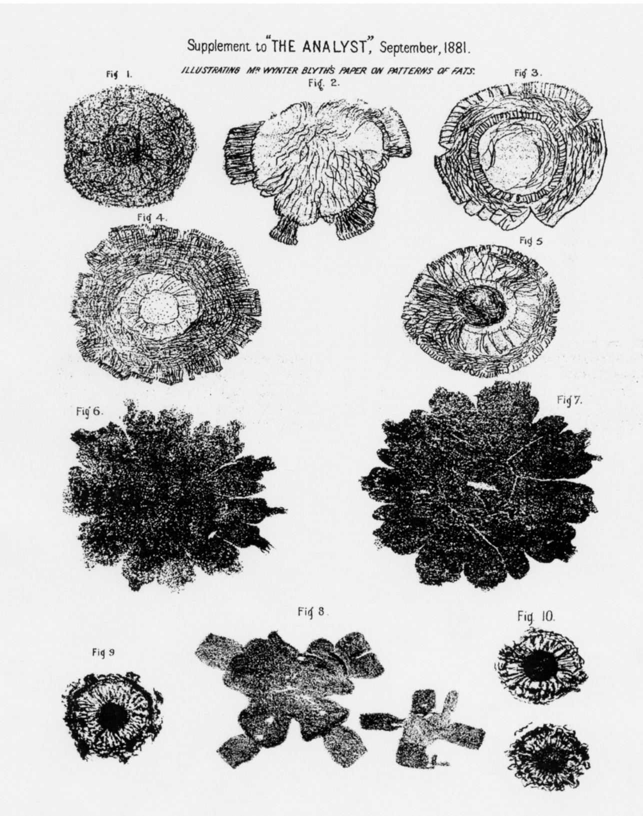


Figure 11

Figures which Drops of Various Fats Assume under Certain Conditions

1, 3 and 5 - butter on glass;

2, 6 and 7 -butter on water;

4 - butterine on glass;

8 - paraffin mixed with stearic acid;

9 and 10 - tallow, stearic acid or spermaceti on glass wetted with absolute alcohol) .

(See Reference 50)

When conditions are controlled each fat may be identified from the pattern of the congealed drops, illustrated in the paper. The system was most useful in distinguishing butter from "butterine" {various mixtures of animal fats sold at that time as artificial butter} [50]. The "Lactocrite", a precursor to the Gerber system, was a patented instrument by de Laval in which milk fat is separated from the milk after strong acidification and centrifugation in special calibrated tubes. Wynter Blyth showed results by that method conformed well to those by Adam's method [51] and that the estimations by the "Lactocrite" method were speedier and more accurate than any other volumetric process yet devised [52]. Wynter Blyth and Robertson examined a series of methods for the separation of the glycerides of butter fat and concluded that butter was made up of compound not simple glycerides [53].

During a comparison of the determination of sugar in milk by the copper cyanide procedure and using polarimeter discrepancies Wynter Blyth noted in a series of milks probably due to the addition of foreign sugars. These he separated and identified via their ozazones after prior precipitation of proteins by acetic acid[54]. Other additives to milk such as preservatives received attention. For salicylic acid Wynter Blyth examined three procedures, dialysis, sublimation and extraction by ether. The methods were also applied to beer. The best recoveries were found with ether extraction after prior concentrations to small bulk [55]. After isolation of boric acid by distillation from methyl alcohol boric he determined it by the effect of boric acid on the rotation of a solution of tartaric acid, by the loss of carbon dioxide from sodium carbonate and from the determination of the conductivity of the solution after the addition of fixed amounts of sodium carbonate solution to 100 c.c. aliquots [56]. Since nitrates in water were indicative of pollution in water they were also a marker for the addition of water to milk. Wynter Blyth devised an apparatus using a mercury valve in which nitrite and nitrates, either singly or together, could be estimated as nitric oxide by means of ferrous chloride[57]. He also examined the nature of the gases contained in milk, solely reported in the various editions of "Foods"[11].

The work by Wynter Blyth and other Public Analysts resulted in an important section in the 1899 "Sale of Food and Drugs Act" that empowered the Board of Agriculture to make regulations as to what deficiency in any of the normal constituents of genuine milk, cream, butter or cheese should raise the presumption "until the contrary is proved" such products were to be regarded as not genuine [3].

Spectroscopic Methods

Wynter Blyth was an early advocate of spectroscopic methods for the detection and identification of dyes and colourants in foods [11] and of poisoning by ammonia by its effect on the spectrum of blood [12] using Sorby's Micro-Spectroscope.

When studying the ultraviolet absorption spectra of egg-albumin, serum albumin, legumin, casein, Schrotter's albumose, certain toxalbumins and tyrosin, Wynter Blyth came to the conclusion that the absorption band of ordinary albumin was identical to that of tyrosin (see Figure 12). Gelatin, Schrotter's albumose and certain other albuminoid substances showed no band (2850-2680Å) and hence in these, tyrosin was absent.

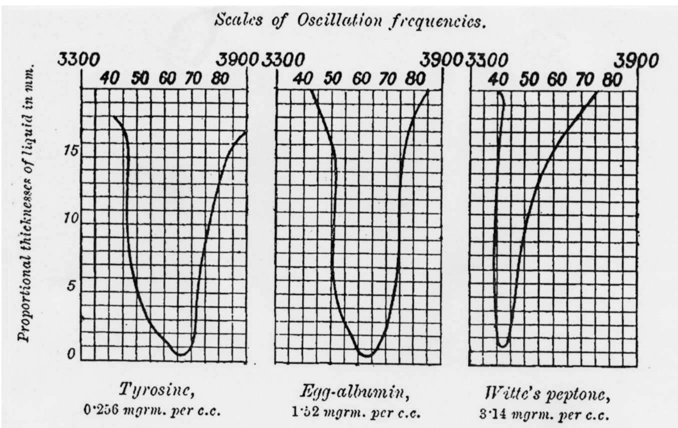


Figure 12

UV Spectrum for Tyrosine, Egg-albumin and Witte's Peptone (See Reference 58)

Thus proteids might be conveniently divided, from a chemical standpoint, into those which show the tyrosine band and those in which the band was absent. To facilitate the study of absorption spectra by avoiding serial dilutions and refilling of a single cell he designed a special cell constructed for him by Mr. Hilger. The cell consisted of block of quartz cut into successive steps (1, 2, 4, 8, 16mm), the faces and backs were perfectly parallel and highly polished [58]. The cell was completed by a quartz plate in front, the sides being of ground glass (see Figure 13).

This "notched echelon cell" was used for many years by subsequent workers [59, 60]. Twyman noting, in 1933, that the idea of a stepped cell, an essential part of his new apparatus for rapid spectophotometry of liquids, was not a new idea but had been described and used by Wynter Blyth in 1899 [61].

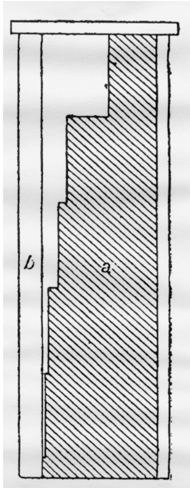


Figure 13

Wynter Blyth's notched quartz absorption cell (See Reference 58)

Conclusion

Wynter Blyth's professional practice as a Public Analyst in London and in Devon contributed much to the suppression of adulteration hence to the provision of pure and wholesome foods in England in the late nineteenth to early twentieth century. His publications concerning his researches, developments and innovations in analytical chemistry and instrumentation were of even wider influence.

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