
Portrait of Vittorio Amedeo Gioanetti (1729-1815) [5]

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VITTORIO AMEDEO GIOANETTI A NOTABLE ITALIAN PHYSICIAN, CHEMIST AND CERAMICIST

Aspects of the personal life of Vittorio Amedeo Gioanetti are reviewed together with his contributions to the methodology for the analysis of mineral waters and to technical aspects of the manufacture of fine porcelain. This last activity, in particular, gave him great popularity and the esteem of the House of Savoy as well as in the French Republic during the period of the French invasion of Piedmont.

Vittorio Amedeo Gioanetti (or Victor Amedeus Gioanetti as he is sometimes called) was born in Turin on 31st October 1729 son of Giovanni Pietro Gioanetti (John Peter Gioanetti) head of the general tobacco agency and a Decurion (member of the City Council) of the city [1-4] [5]. He entered the Royal University of Turin to study medicine in 1747 and graduated in 1751. Six years later he was admitted to the Royal College of Physicians, Turin. Little is known of his medical activities except that he was in practice for 18 years in the Regio Parco of Turin and was widely appreciated for his humane manner as well as for his professional qualities. It appears he devised an effective purgative solution which bears his name. During his time as a physician in Turin he set up a private laboratory and carried out chemical research, works for private clients and gave lessons to the youths of the best families. According to Bonino [6] he made over 3,000 lire each year from the laboratory.

He was a member of the *Accademia delle Scienze di Torino* [7] listed in the *Mémoires* for 1786 under the heading "National Academicians" as "Docteur en Médicine, Pensionnaire du Roi" and in 1788 as "docteur agrégé à la faculté de médicine, pensionnaire du Roi, & associé libre de la société royale d'agriculture de Turin". King Vittorio Amedeo III held Gioanetti in high regard and came to the decision to establish a Chair of Chemistry at the University of Turin and to appoint Gioanetti to it. However some influential persons, envious of Gioanetti success, worked against this project so that it was abandoned. In 1800, during the French invasion, two chairs were established, one for chemistry applied to medicine, the other for chemistry applied to arts and manufacture. Gioanetti was not appointed to either chair; G.B. Bonovicino got the first and G.A. Giobert the second chair. Interestingly, Modica in his account of "Chimica e Accademia" considered these three as the "fathers of Italian Analytical Chemistry" [7a].

At the considerable age of 70, on the 24th October 1799 in the Duomo di Torino, he married the 28 year old, Anna Maria Battaglino who bore their first child, Clara Margherita, on 13th November 1799. They had 8 children, their youngest, Angela Caterina was born 29th November 1815, the day before her father died. Gioanetti made significant contributions to methodology for the analysis of mineral waters and to the manufacture of porcelain, despite these contributions he was not mentioned by Partington [8].

Contributions reported in Analyse Des Eaux Minerales de S. Vincent et de Courmayer [9] and their impact

The original contributions to mineral water analysis

Gioanetti declares on the title page (see Fig. 1), in the preface and in the text that his book contains new analytical methods [9]. First he describes various qualitative tests, examination of the distillate from the mineral water then to the analysis of the residue after evaporation of the mineral water.

Gioanetti began working on his first method of analysis [9a] of the residue in July 1778. He proceeded as follows: 96 livres of water from St. Vincent were evaporated and yielded a residue of 4,544 grains. Using distilled water a soluble saline mass was extracted, weighing 3,648 grains. This mass consists of sodium sulphate, sodium chloride and sodium carbonate. The Glauber salt (sodium sulphate) could be separated from the rest by crystallization but the two other salts could not be separated by continued evaporation. To determine the chloride and alkali content he dissolved 456 grains of the original residue (corresponding to 12 livres of mineral water) and on evaporation obtained $316^{1}/_{2}$ grains of Glauber salt, he then evaporated to dryness and got a mass of $139^{1}/_{2}$ grains. Gioanetti proceeded by adding acetic acid to saturation. He then standardised the acetic acid solution with sodium carbonate. From the amount of acetic acid he calculated the amount of sodium carbonate present. Thus the original mass of $139^{1}/_{2}$ grains contained 42 grains *sal commun* (sodium chloride) and $97^{1}/_{2}$ grains *de natron* (sodium carbonate). Gioanetti established that the sodium carbonate used for the standardisation was pure enough by neutralising a known amount of sodium carbonate with acetic acid, extracting the sodium acetate with alcohol, evaporation to dryness, igniting to form sodium carbonate. Comparison of the weight of the residue with that of the original sodium carbonate indicated the purity. Gioanetti was not convinced of the accuracy of this method and went on to describe a second method which, incidentally, gave almost the same results

In the second method [9b], 456 grains of the original saline mixture was treated with acetic acid (to saturation + a small excess) and extracted with alcohol. This causes dissolution of "*la Terre foliage de natron"* (sodium acetate).The dried undisclosed salts weighed $357^{2}/_{3}$ grains, thus there was $98^{1}/_{3}$ grains sodium carbonate in the 456 grains saline mixture. Gioanetti mixed alum with the $357^{2}/_{3}$ grains saline mixture and distilled off hydrochloric acid, absorbed this in water and titrated this with pure sodium carbonate using turnsole (litmus) solution as indicator. He evaporated this solution in a porcelain cup and obtained 41 grains *sal marine* (sodium chloride).

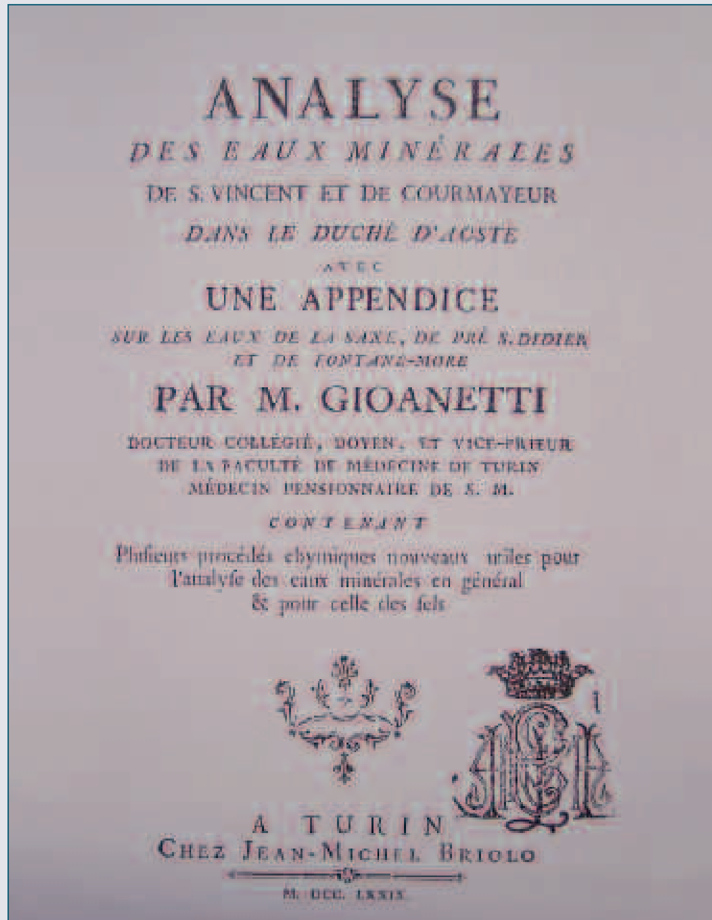
ANALYSE
DES EAUX MINÉRALES
DE S. VINCENT ET DE COURMAYEUR
DANS LE DUCHÉ D'AOSTE
AVEC
UNE APPENDICE
SUR LES EAUX DE LA SAXE, DE PRÉ S. DIDIER
ET DE FONTANE-MORE
PAR M. GIOANETTI
DOCTEUR COLLÉGIÉ, DOYEN, ET VICE-PRIEUR
DE LA FACULTÉ DE MÉDECINE DE TURIN
MÉDECIN PENSIONNAIRE DE S. M.
CONTENANT
Plusieurs procédés chymiques nouveaux utiles pour
l'analyse des eaux minérales en général
& pour celle des sels
A TURIN
CHEZ JEAN-MICHEL BRIOLO
M. DCC. LXXIX.

Fig. 1 - Title page of Analyse Des Eaux Minérales [9]

The part of Gioanetti's method, that of the determination of the alkali content of a mineral water by drop-wise addition of acid till saturation, was known to Lavoisier along with Macquer. They reported to the French Academié, 11th. March 1778, on a mémoire of M. Mitouart, describing a similar procedure [10]. As this information could only have been known within a very narrow circle, this part of Gioanetti's procedure can be regarded as an independent co-discovery. So far, it has not been possible to trace the mémoire by Mitouart.

Their impact

The contributions of Gioanetti were virtually unknown in the twentieth century, being omitted by Partington [8], until the studies of Rancke-Madsen [11] and Szabadaváry [12] drew attention to them. This is in complete contrast to the position in Gioanetti's lifetime, for shortly after the publication of his text in 1779 [8], its contents rapidly became well

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cubic inch) the ſame quantity procured from the water by the pneumatic veſſel.*

This experiment was made with a view of aſcertaining the accuracy of the pneumatic machine, and this coincidence ſurpriſed me; I therefore repeated this experiment with lime-water as carefully as poſſible, and the weight of the precipitate was within leſs than half a grain of the laſt. Hence it appears that this veſſel is not only by much the moſt convenient for experiments of this nature, but that its accuracy may be relied on with great certainty.

* The invention of this method of aſcertaining the quantity of carbonic acid by means of lime-water, has generally been attributed to Mr. Gioanetti; but in a letter which I received from Dr. George Pearſon, ſoon after the publication of the firſt edition of this treatiſe, he aſſerts his claim to the diſcovery, which, he ſays, was publiſhed in his treatiſe on the Buxton waters, before it was made known by Mr. Gioanetti.

Fig. 2 - The false claim made by George Pearson to Thomas Garnett [26]

known and were cited, internationally. In 1780 the text's content was initially brought to the attention of a wide audience of chemists by the four sets of notes about Gioanetti's methods, added by De Morveau to his translation into French of Volume 1 of Bergman's *Opuscules Chymiques et Physiques* [13]. Two years later, de Fourcroy [14] referred to Gioanetti's work on vegetable astringent principles for the detection of iron and made no less than nine references to Gioanetti in his chapter on mineral waters. Chaptal [15] described Gioanetti's method for the determination of carbonic acid by precipitation with lime-water. The English translations of these three works, by Bergman [16], Fourcroy [17] and Chaptal [18], were all popular and influential in the late eighteenth and early nineteenth centuries and further spread the knowledge of Gioanetti's innovative methodology for mineral water analysis. Bonvicino referred to Gioanetti's studies on the solubility of salts in his *Commentarii de Rebus in Scientia Naturali et Medicina,* paper on the same topic [19]. Kirwan in his monograph, a standard text for several decades, on the analysis of mineral waters notes Gioanetti's caution with regard to "spot tests" and gave a detailed account of Gioanetti's separations of salts with alcohol [20].

In addition to the notice taken by the chemical community, Gioanetti's methods were of interest and use to Physicians, particularly those in Spa towns where many used the results of mineral water chemical analyses to promote their medical practices. In the late 1700's the wealthy in Great Britain, as in the rest of Europe, made the "Grand Tour of Europe", hence the names medical practioners in the main towns on the normal grand tour route were listed in publications such as the *London Medical Register* [21], in which Gioanetti was listed in 1780, under the Royal College of Physicians, Turin. Notice was given of his *Analyses des Eaux Minerales de S. Vincent* in the Edinburgh *Medical Commentaries* for 1781-2 [22]. British physicians who published on the "nature and medicinal virtues of spa waters" and cited Gioanetti include John Ash (1723-1798) [23], Sir John Elliot (1736-1786) [24], Anthony Fothergill (1732-1813) [25], Thomas Garnett (1766-1802) [26] Robert Graves (1763-1849) [27], and Andrew Carrick (1767-1837) [28].

The second and third editions of the text by Thomas Garnett [26a] contain an intriguing footnote: "The invention of this method of ascertaining the quantity of carbonic acid by means of lime-water, has generally been attributed to Mr. Gioanetti; but in a letter I received from Dr. George Pearson, soon after the publication of the first edition of this treatise, he asserts claim to this discovery, which he says, was published in his Treatise on Buxton waters before it was made known by Mr. Gioanetti" (see Fig. 2).

This was a strange claim to make, indeed it appears to be false, as although Pearson published two books on Buxton waters, they appeared in 1784 [29] and in 1785 [30]. His great number of experiments "adding lime-water to saturate the well water" are dated as carried out in 1782 or 1783. Both books and the experiments described therein were carried out well after the publication of Gioanetti's book, 1779. This claim is perhaps not completely out of character for Pearson, who whilst he acknowledged Jenner's priority for the introduction of vaccination, wrongly claimed he had done more to promote vaccination against smallpox than had Jenner and that it was due to the extensive use of vaccination in London by Woodville and himself that its establishment was ensured [31].

Gioanetti's analytical data was cited for many years in composite accounts of mineral waters springs in Italy, for example by Giacosa [32] and Bertini [33].

Luminescence

Following the earlier work of Robert Boyle and others on luminescence of shining fish, flesh and wood, interest in the subject continued in Europe in the eighteenth century [34, 35]. Gioanetti investigated a reported luminous phenomenon in the water of Eglise, a hamlet in the Fontane-More parish in the Duché d'Aoste. He found no light in the water but bright luminous specks in the mud, which were little animals, perhaps the "nymphs of luminous flies". He also remarked that perhaps luminous wood contained luminous animalcules [36].

Stoneware and porcelain manufacture

Though Gioanetti was the first important chemist in Piedmont, his name is best known in relation to “Vinovo porcelain” which was, and still is, considered the best porcelain in Europe of its period, worthy to compete with the Chinese porcelain, though no kaolin was used for its production. His deep knowledge of chemical composition of soils and minerals in Piedmont sites certainly guided Gioanetti in the selection of materials suitable for the manufacture of grès (stoneware) and of porcelain. We do not have any of his analytical data but the same materials were examined later by Giobert [37] and by Sobrero [38] who also examined the porcelain made by Gioanetti at Vinovo [39].

At first Gioanetti limited himself to the manufacture of articles in stoneware gaining permission in 1st November 1774 but gave up this manufacture at Vische in 1776 as it was not profitable in exchange for an annuity of 600 lira to avoid competition with the factory established in Vinovo in 1775.

In April 1780 by invitation of the King, Vittorio Amedeo III, he took over the porcelain factory at Vinovo previously established by Brodel and Hannong, after its failure. The Royal Patent (see Fig. 3), dated 12th. April 1780 also notes the earlier grant Patent to Gioanetti for the manufacture of grez [4a]. Under Gioanetti the factory (see Fig. 4) produced some of the best European porcelain from local raw materials. Due to his chemical and technological skills the factory produced porcelain in which the coefficient of expansion of the glaze and body matched and pigments that gave delicate and natural colours. The wide ranging output was technically and artistically excellent as illustrated by De-Mauri [2], Mattirollo [3], Ruberi [4], Martinengo [40] and Stazzi [41]. Due to financial difficulties, in June 1784 Gioanetti published a prospectus to establish shares in favour of the Royal Manufactory of Vinovo Porcelain. The Reale Accademia delle Scienze di Torino took up 12 shares [7b].


REGIE PATENTI

IN SEGUITO

AL MEMORIALE A CAPI

Portante i Privilegi da S. M. accordati a favore della Fabbrica di Porcellana stabilita nel Regio Castello di Vinovo

CON

Diverse altre provvidenze della M. S., e de' suoi Regj Magistrati per il medesimo oggetto

In data delli 12. luglio 1780.

IN TORINO

NELLA STAMPARIA REALE

Fig. 3 - Front page to the Royal Patent granted to Gioanetti to manufacture porcelain at the Castle at Vinovo


Fig. 4 - View of part of the castle and remains of the porcelain factory at Vinovo (taken in Summer 2008)

The Vinovo factory mark is generally in the form of a V surmounted by a cross (emblem of the House of Savoy) in blue, grayish blue, black (quite rare) or gold. In some instances the cross appears alone or is not joined to the V, such marks bear the date of manufacture as well [3, 4]. On pieces of the Gioanetti period the letters DG (Dr. Gioanetti) sometimes appear under the V and cross mark. Other letters in underglaze colour give the initials of the painter who worked on the item. Incised letters and numbers on the bases refer to modellers, retouchers or to the classification of the products.

After the Napoleonic invasion of 1796 production was much reduced, due to lack of patrons. The French Government fearing competition with Sèvres demanded from Gioanetti the complete list and amounts of materials used in his porcelain. In 1807 Brongniart, the Director of the Sèvres manufactory received the formulation which he inserted in his *Traité des Arts Céramiques* [42]. This list, together with a description of the 21 Piedmont clays used for pottery production that Gioanetti revealed to his friend Ghigliossi are the only official testimonies of his skilled technique. This information, however, was somewhat sparse because Gioanetti was naturally a reserved man, very jealous about his recipe. Some more details were given by Sobrero [38, 39] and Giobert [37] who argued, by analyzing the Vinovo porcelain, that its superb quality as well as the variability of its quality were ascribable to the "key ingredient" used by Gioanetti that was the "Magnesite di Baldissero", which mainly was magnesium carbonate and not silicate as Brongniart believed. Thanks to his valuable chemical knowledge, Gioanetti "corrected" the characteristics of this magnesite by adding aluminum silicates.

When the King returned and visited in 1815 Gioanetti was still earnestly at work, but died the same year. The works continued for few years under Giovanni Lomello (by the way, Lomello married the widow of

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Gioanetti, Anna Maria Battaglino) but only produced objects of poor quality; in the attempts which followed, made first by Michele Stoppini sculptor and then by Cesare della Chiesa to get back to the original quality production failed and the Vinovo factory closed finally in 1824.

In conclusion

Gioanetti had an impressive chemical intuition in addition to a genuine passion for study and research work. Despite being a self-taught in the field of chemistry, his work in the development of original methods of analysis as well as in the selection, purification and accurate mixing of raw materials for fine pottery production was superb. It is not clear why Gioanetti's contributions to the methodology of the analysis of mineral waters and porcelain manufacture have been overlooked by historians of chemistry for almost 150 years. That he was not appointed to the Chair of Chemistry at the University of Turin can be regarded as acting in favour of the artistic heritage of Italy.

Fine porcelain manufacture was a major passion in Gioanetti's life: the chemist and the artist marvelously fused to reach levels of exceptional refinement.

He is now commemorated in Vinovo, by the name of State School for Media Studies, "Scuola Media Gioanetti". The site of the works at the Castello di Vinovo is available for visits.

Acknowledgements: D.T.B. and L.S. wish to thank respectively the staff of the Science Library, The Queen's University of Belfast, and of the Chemistry Department Library, University of Bari, for the great assistance and the facilities provided during the researches and preparation of this paper. This research was carried out as part of the programme of the Study Group, "History of Analytical Chemistry in Europe" of the Division of Analytical Chemistry (DAC, www.dac-euchems.org/) of the European Association for Chemical and Molecular (EuCheMS).

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