A Most Capricious Instrument

95 years of tearing our hair out.

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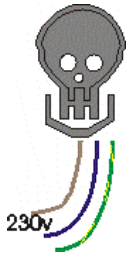
Disclaimer

Mass spectrometers can cause pain

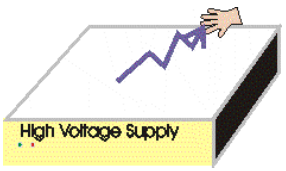


230 Volts can kill

Mental pain!

Hot soldering irons can burn

Protect your eyes



3000 volts can kill

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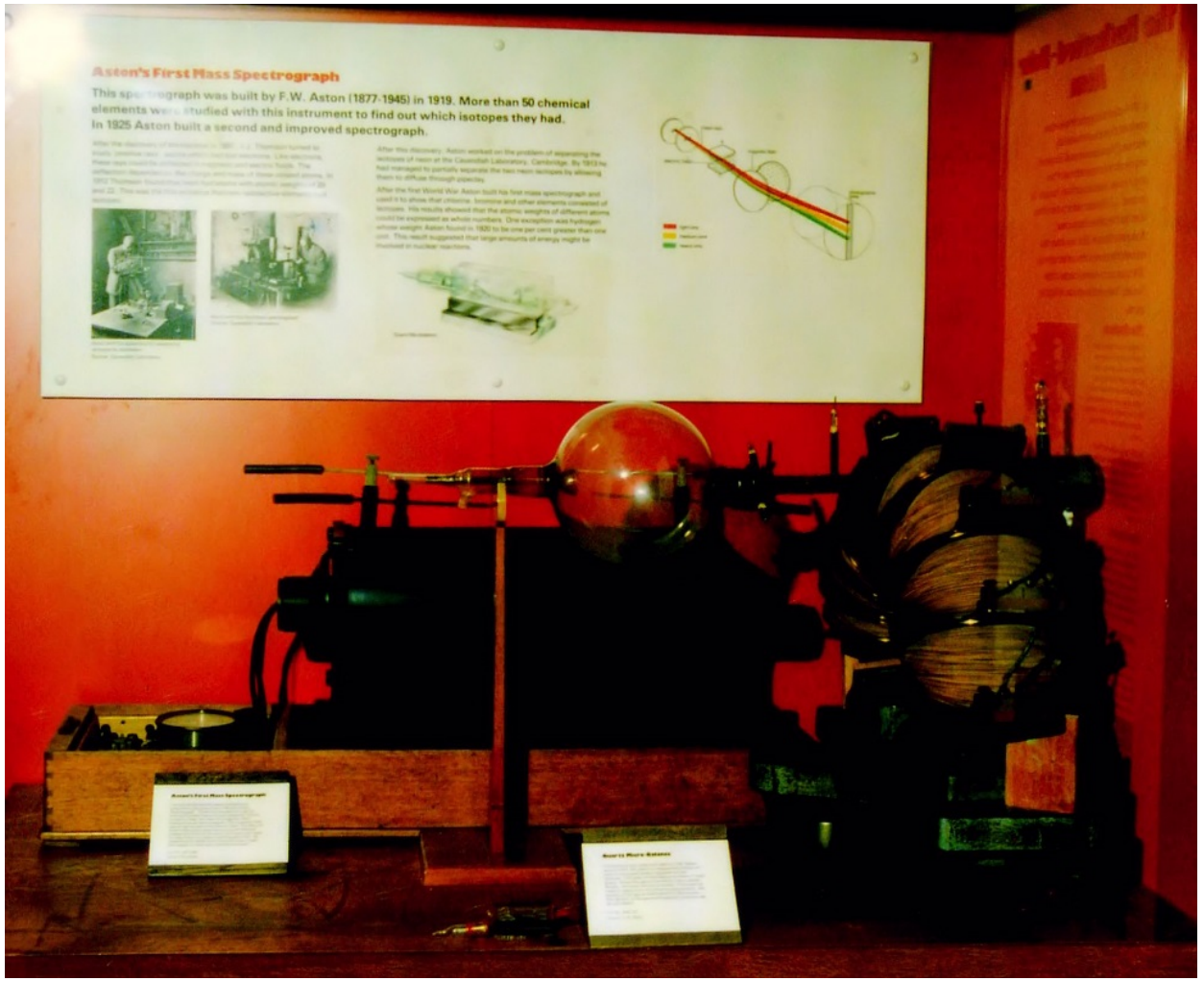
In the beginning



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F.W. Aston

Table of Results.

Element.	Atomic number.	Atomic weight.	Minimum number of isotopes.	Mass of isotopes in order of intensity.
H	1	1·008	1	1·008
He	2	3·99	1	4
C	6	12·00	1	12
N	7	14·01	1	14
O	8	16·00	1	16
Ne	10	20·20	2	20, 22, (21)
Cl	17	35·46	2	35, 37, (39)
A	18	39·9	(2)	40, (36)
Kr	36	82·92	6	84, 86, 82, 83, 80, 78
X	54	130·2	5	(128, 131, 130, 133, 135)
Hg	80	200·6	(5)	(197–200, 202, 204)

[Numbers in brackets provisional only.]

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Dual Inlet

602 with dual inlet

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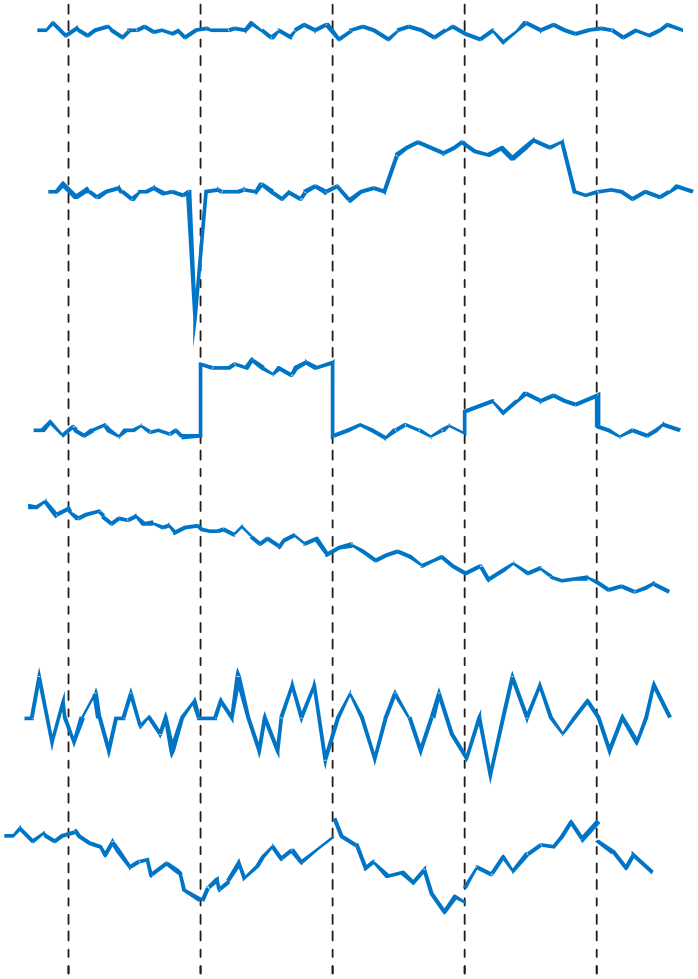
Dual Inlet Analysis



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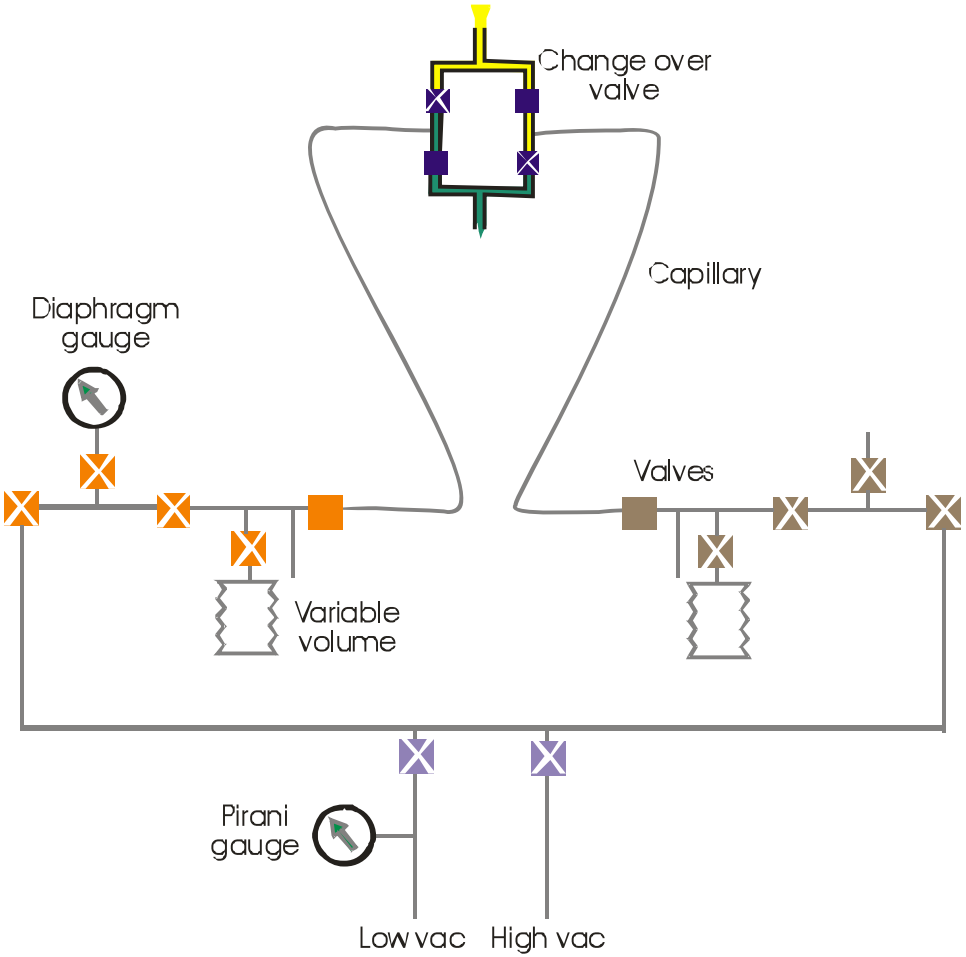
Dual Inlet



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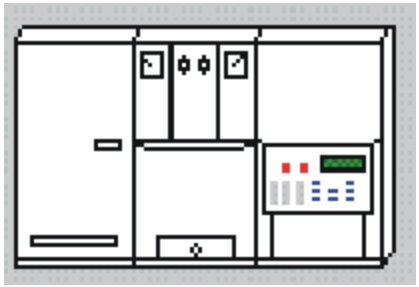
Trapping Boxes



120ml/min Helium

LN2

10^{-6} mbar

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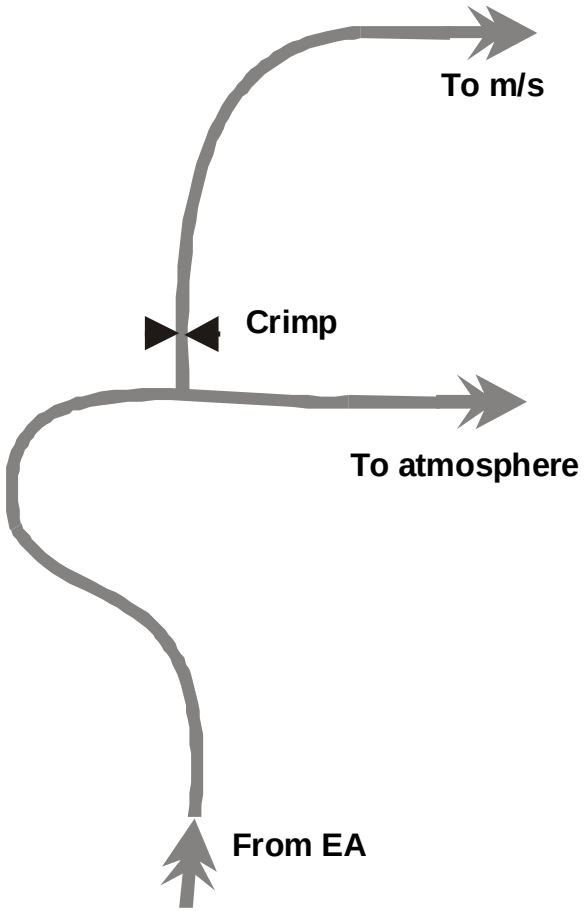
1st Continuous Flow



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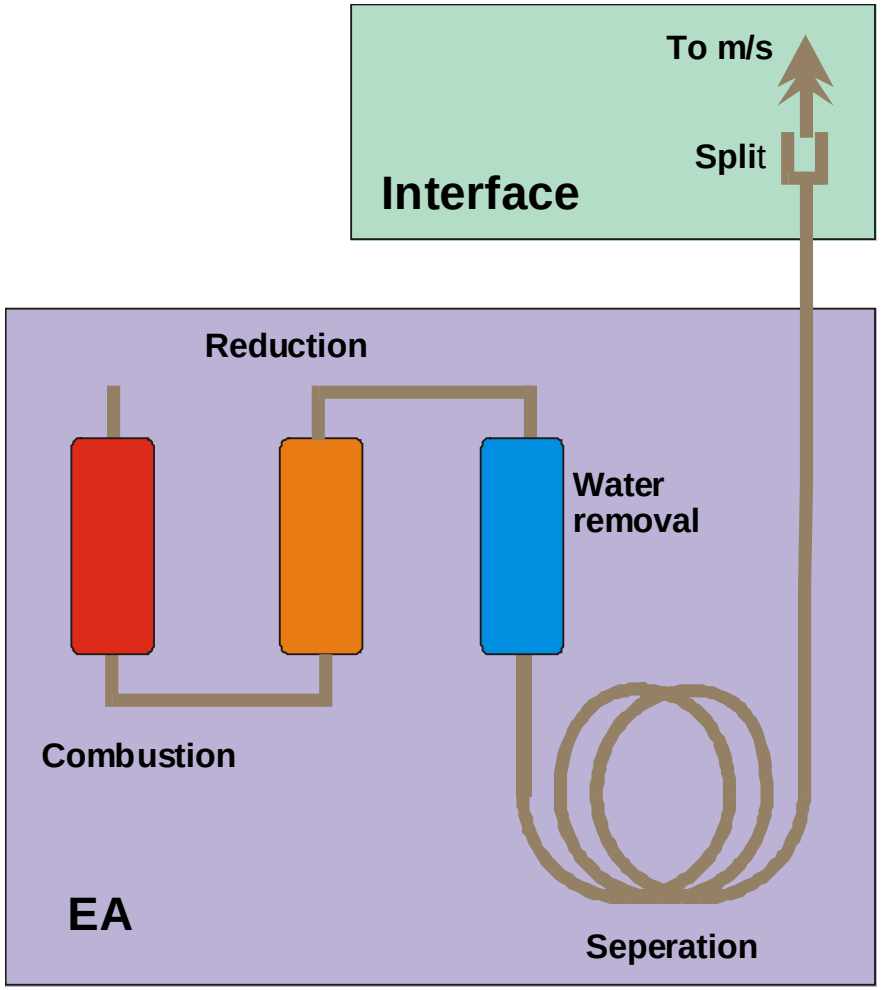
2nd Continuous Flow



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Early EA-IRMS

- Reference1
- Reference2
  - Sample1
  - Sample2
  - Sample3
  - Sample4
  - Sample5
  - Sample6
  - Sample7
- Reference3
- Reference4

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Along came the reference gas

By inserting a second capillary with a reference gas into the open split a reference peak can be added to the analysis.

- Reference peak is close in time to the sample peak.
- Operating conditions remain constant during one measurement for sample and reference peaks.
- If known standards are run as samples through the run, the reference gas need not be calibrated

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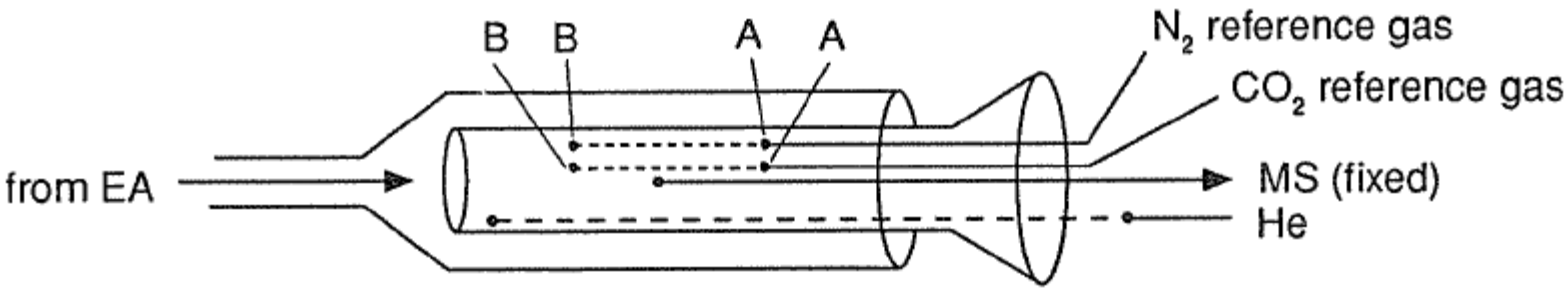
Along came the reference gas

Fig. 2 - 5 Standard capillaries



Position A: up, no standard gas injected

Position B: down, standard gas injected

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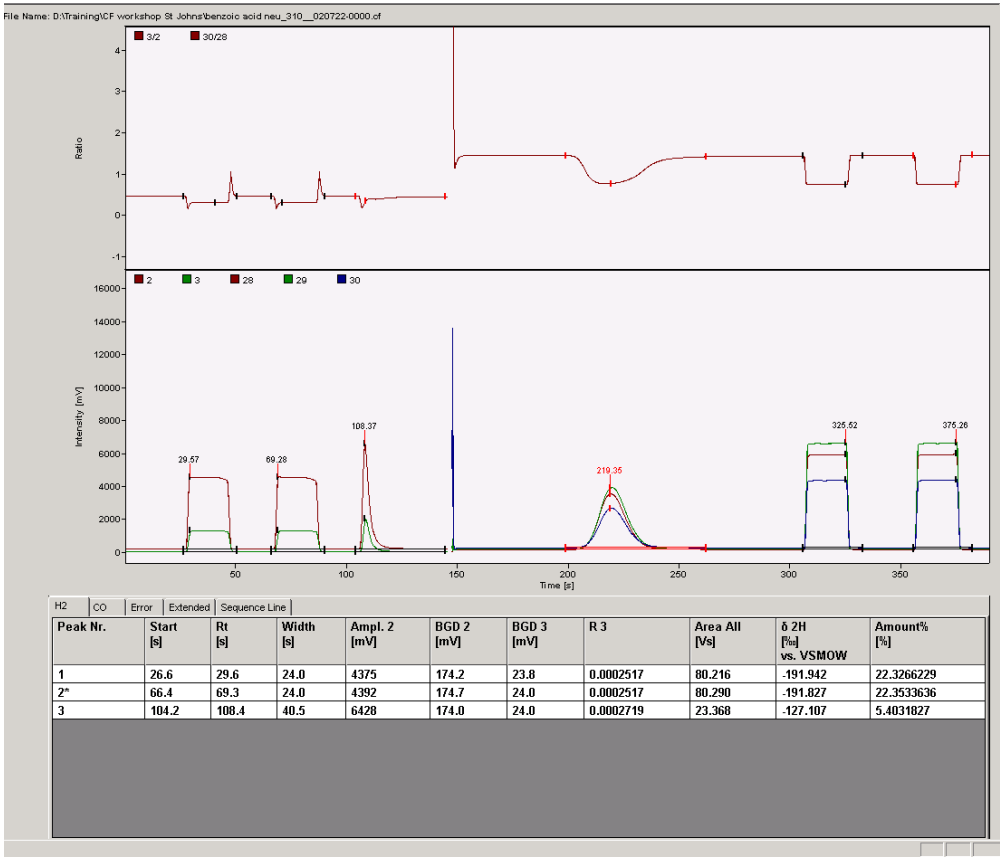
Reference peaks



H2 | CO | Error | Extended | Sequence Line

Peak Nr.	Start [s]	Rt [s]	Width [s]	Ampl. 2 [mV]	BGD 2 [mV]	BGD 3 [mV]	R 3	Area All [Vs]	δ 2H [‰] vs. VSMOW	Amount% [%]
1	26.6	29.6	24.0	4375	174.2	23.8	0.0002517	80.216	-191.942	22.3266229
2*	66.4	69.3	24.0	4392	174.7	24.0	0.0002517	80.290	-191.827	22.3533636
3	104.2	108.4	40.5	6428	174.0	24.0	0.0002719	23.368	-127.107	5.4031827

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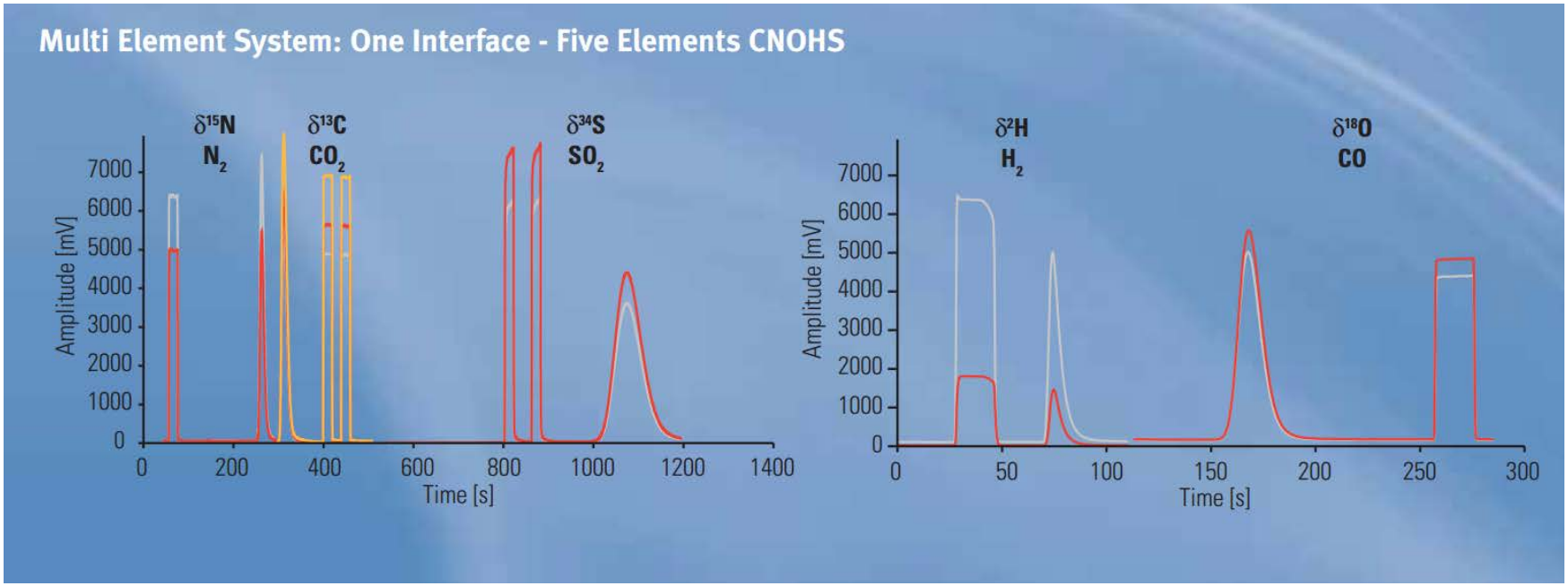
Current State of the Art - Interface



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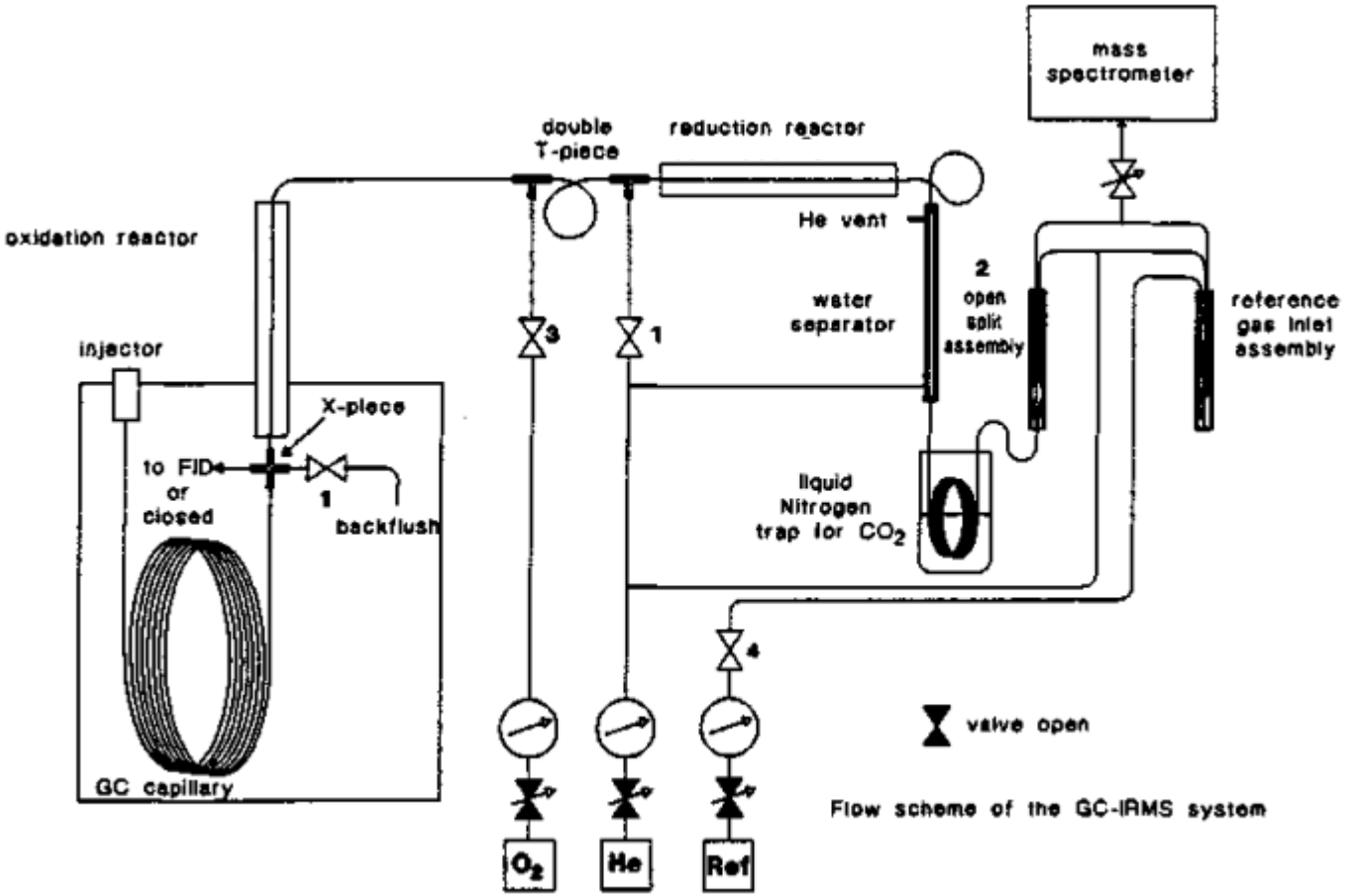
GC



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GC-TC

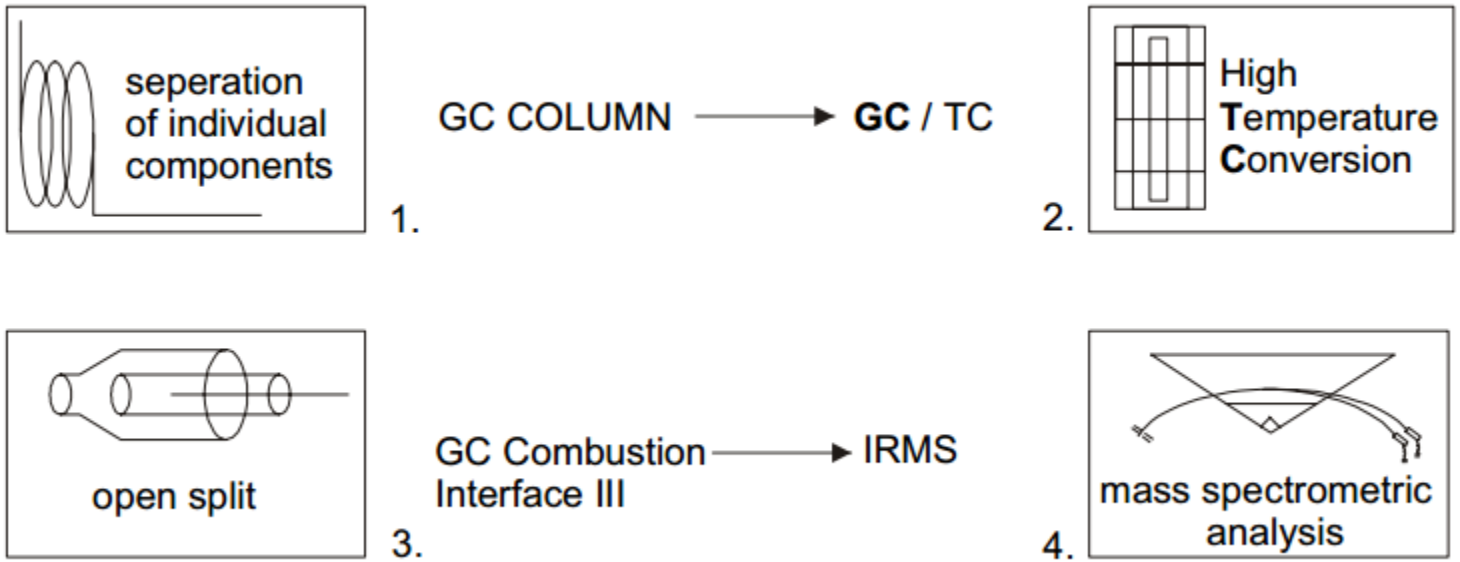

Fig. 2–1

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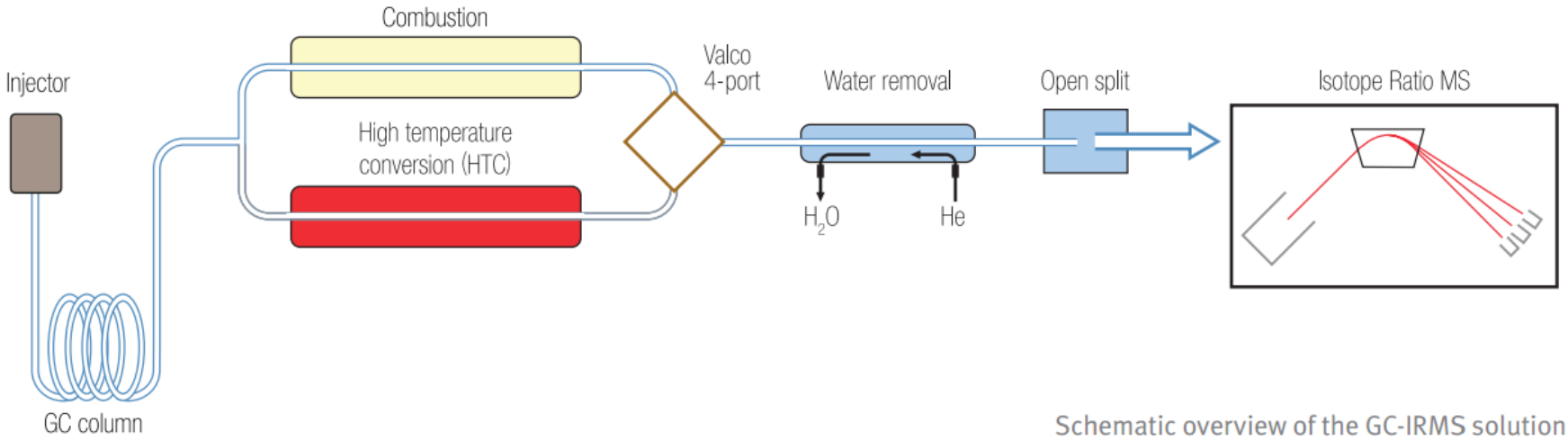
Current State of the Art - GC



Schematic overview of the GC-IRMS solution

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Francis William Aston

"It behaves at times in the most capricious and unaccountable manner...when by good fortune, all is well, the arrangement is capable of good performances. Thus, after a favourable setting of the apparatus, six elements were successfully analysed in as many days.

On the other hand, after dismantling became imperative and it had to be cleaned and rebuilt, exactly as before as far as one could tell, no results of any value were obtained during weeks of work."

ISOMASS
SCIENTIFIC INC.

#140, 5700 – 1 Street S.W.,
Calgary, Alberta T2H 3A9
isomass@isomass.com
Tel: (403) 255-6631 · Fax: (403) 255-6958
Toll Free: 1-800-363-7823