in exact proportion as our observation of them has become more exact, until at last it has been compelled to take refuge in those lowest forms which we are almost or altogether unable to observe, is really of little or no force. Its cogency depends on analogy, and the analogy has no existence. It is quite equally to be expected *à priori* that if any forms of life are generated spontaneously, they will be the very lowest and simplest forms, and since these happen to be also the most minute, the objection loses its whole force. And it is also a thing to be expected that we should find only the lowest forms, the earliest, *i. e.* in the scale of existence, produced under the disadvantageous circumstances in which they must be placed in such experiments as those above detailed.

The other remark is this, that, so far as my present researches have led me, I cannot but look upon improvement in the construction of microscopes, and increase of their power, as the only way in which our means of investigation of such questions as the production of Bacterium is likely to be largely increased. The $\frac{1}{50}$ object-glass recently constructed by Messrs. Powell and Lealand, of which a notice has appeared in the Proceedings of the Royal Society, has already shown something like an appearance of structure in these minute objects, and leaves, I think, no doubt about their organic character.

II. "On the Magnetic Character of the Iron-built Armour-plated Battery 'Pervenetz' of the Imperial Russian Navy." By Capt. J. Belavenetz, R.I.N., Superintendent of the Compass Observatory at St. Petersburg. Communicated by Archibald Smith, M.A., Corresponding Member of the Scientific Committee of the Imperial Russian Navy. Received March 23, 1865.

1. The 'Pervenetz' is an iron-built armour-plated ship of war, constructed for the Russian Government by the Thames Iron and Ship-Building Company at their works at Blackwall.

2. The following are her dimensions:—

Length	220 feet
Breadth	53 feet
Depth of hold	26·6 feet
Builder's measurement	2393 tons
Horse-power	300

3. The upper and main decks were plated with sheet iron.

4. The greater part of the side plating was fixed in England and while the observations recorded in the paper were made, but no part of the end plating was fixed, the plates being taken on board and carried as cargo.

The direction of her head in building was S. 22° 17′ W. magnetic.

5. The author was commissioned by the Russian Government to superintend the compass equipment and compass correction of the ship. He

arrived in England a few days before the launch, and immediately undertook the observation of the deviation and the horizontal and vertical force at various selected positions in the ship. These were the following, viz. five positions on the upper deck, about 4 ft. 6 in. above the deck, distinguished as *b, c, d, e, f*, going from stern to bow; *b* abaft the mizen-mast, *c* immediately before the mizen-mast, *d* before the main-mast, *e* about the middle of the length, and *f* before the fore-mast: three on the main deck, *g, k, l*; *g* halfway between the mizen and mainmasts, *k* below *d*, and *l* below *f*: two in the hold, near the centre of the ship, *m* and *n*: *b* being near the place where the neutral plane or rather the surface separating the part of the ship which displayed north magnetism from that which displayed south magnetism intersected the deck, was selected as a place for the standard compass, and a place was prepared for it by making there a false hatchway or compass platform, by replacing an iron beam by a wooden beam, and substituting wood planks for iron plates at that part of the deck.

6. From the observations, using the notation of the 'Admiralty Manual' (which has been translated into Russian by the author for the use of the Imperial Navy), by estimating the value of $\mathfrak{D}$ and λ, and making use of the formulæ of the Manual, 2nd edit., p. 110,

$$\mathfrak{B}=\frac{H'}{\lambda H}\cos\zeta'-(1+\mathfrak{D})\cos\zeta,$$

$$\mathfrak{C}=-\frac{H'}{\lambda H}\sin\zeta'+(1-\mathfrak{D})\sin\zeta,$$

the author obtained from the observations made the following results:—

	Place of Compass.	Deviation.	Hor. force, $\frac{H'}{H}$.	Vert. force, $\frac{Z'}{Z}$.	Assumed.		Computed.	
					$\mathfrak{D}$.	λ.	$\mathfrak{B}$.	$\mathfrak{C}$.
Shore.	*a*		1	1				
Upper deck.	*b*	3° 55′ W.	·286	·700	·100	·800	·700	−·170
	c	1° 36′ W.	·247	·906	·150	·800	·782	−·190
	d	9° 20′ W.	·191	1·168	·150	·820	·855	−·200
	e	30° 6′ W.	·139	1·332	·150	·820	·955	−·200
	f	28° 58′ W.	·169	1·971	·150	·820	·930	−·158
Main deck.	*g*	16° 27′ E.	·130	·134	·186	·790	·932	−·293
	k	14° 41′ E.	·230	·156	·186	·790	·807	−·270
	l	11° 11′ E.	·058	·154	·186	·790	1·025	−·286
Hold.	*m*	15° 11′ E.	·138	·074	·200	·700	·910	−·270
	n	17° 41′ E.	·216	·059	·200	·700	·802	−·281

7. These show—

(1) The small deviations on the stocks of the compasses in every position, except near the north end of the ship, where, probably from the armour-plating not being fixed, irregular deviations were to be expected.

(2) The great diminution of horizontal force, especially near the south end.

(3) The very great increase of vertical force near the south end on the upper deck, and the great diminution of the vertical force in descending. From these we infer that there would be a very large heeling error to windward at *f*, and a large heeling error to leeward on the main deck.

(4) The very large amount of semicircular deviation, both as regards $\mathfrak{B}$ and $\mathfrak{C}$, the last having a large negative value in consequence of the port-side of the vessel having been to the south in building.

8. The best place for the compass is point *b*, near which the standard compass was afterwards fixed.

9. We also see that at the point *l* the deviations exceed 180°. It is to be observed, however, that from the armour-plating not being fixed, we must not accept this as an instance of what the deviation would be in a completed vessel.

10. The 'Pervenetz' was launched on the 21st of May, and on the same day moved to the Victoria Docks. On the way and in the dock the deviations were observed at the point *b*, and the following values of $\mathfrak{B}$, $\mathfrak{C}$, $\mathfrak{D}$ were obtained:—

$$\mathfrak{B}=+\cdot 639, \qquad \mathfrak{C}=-\cdot 136. \qquad \mathfrak{D}=\cdot 100.$$

11. On the 22nd of May she was moved in the dock, and the following observations were made at the point *b*:—

Ship's head by Compass.	Deviation.	Hor. force, $\frac{H'}{H}$.
S. 46° E.	40° 30′ E.	·606
N. 27° W.	18° 00′ W.	1·419

from which the following values of the coefficients are derived:—

$$\mathfrak{B}=+\cdot 736, \qquad \mathfrak{C}=-\cdot 122, \qquad \mathfrak{D}=\cdot 126, \qquad \lambda=\cdot 806.$$

12. Observations at the other positions showed that the assumed values of λ and $\mathfrak{D}$ did not differ much from the truth.

13. The vessel lay in the Victoria Docks till the 27th of July, with her head very nearly N. 55° E. At the end of that time the coefficients were—

July 27, 1863.	Deviation. Head N. 55° E.	$\frac{H'}{H}$.	$\frac{Z'}{Z}$.	$\mathfrak{D}$.	λ.	$\mathfrak{B}$.	$\mathfrak{C}$.
b	18° 50′ E.	·879	1·039	·083	·850	+·210	+·140
c	26° 50′	1·089	·994	·150	·800	+·541	+·060
d	21° 10′	·890	1·219	·150	·820	+·241	+·098
e	35° 10′	1·117	1·061	·150	·820	+·618	+·258
f	26° 20′	·960	1·494	·150	·820	+·400	+·114
g	30° 00′	·904	·045	·186	·790	+·357	+·190
k	26° 30′	·973	·134	·186	·790	+·400	+·087
l	33° 47′	·913	—·012	·186	·790	+·391	+·260

14. Comparing these values with those in Table I., we see the great changes which the magnetism of the ship had undergone in the Victoria Docks.

15. The ship having her head to the east instead of to the west, all the 𝔈's had changed from − to +, and having had her head to north instead of south, all the 𝔅's had diminished.

16. From the same cause we see that Z at the stern increases, at the bow diminishes; at *d* there is an increase of Z, owing to the machinery under that part of the deck.

17. At one point in the main deck Z is negative, showing that the upward vertical force of the ship was greater than the vertical force of the earth. The great apparent change in H arises from the part of the ship which was south in building, and which consequently attracted the north end of the ship, having been directed to the north, and increasing instead of diminishing the directive force.

18. The force of the ship was greatest when the ship was first placed with her head in the new position, and greatly diminished afterwards, as will be seen from the following Table.

Value of $\frac{H'}{H}$, ship's head at N. 55° E.

Compass.	*b.*	*c.*	*d.*	*f.*	*g.*	*l.*
1863.						
June 2 ..	1·296	1·382	....	....	....	....
" 15 ..	1·079	1·139	....	1·316	....	1·301
" 29 ..	1·016	1·075	1·114	....	....	1·187
July 13 ..	1·016	1·051	1·040	....	·952	1·040
" 27 ..	·879	1·089	·890	·960	·904	·913

19. On leaving the Thames for the Baltic the 'Pervenetz' had five compasses:—

1. The Standard, in the position *b*, but 7 feet 6 in. above the upper deck.
2. The Bridge Compass.
3 & 4. Two Binnacle Compasses.
5. The Main-deck Compass.

20. The following Table of the Coefficients is derived from observations made in the Thames on the 3rd of August.

Compass.	A. 𝔄.	B. 𝔅.	C. ℭ.	D. 𝔇.	E. 𝔈.	λ.	μ.	Part of D from fore-and-aft induction.	Part of D from transverse induction.	Heeling error.
Standard	−19′ −·005	+16° 59′ +·305	+2° 29′ +·040	+5° +·087	−1′ ·000	·818	1·000	−3° 52′	+8° 52	+ ° 48′
Bridge	−33′ −·009	+24° 18 +·424	−1° 14′ −·020	+2° 52′ +·050	−32′ −·009	·841	1·186	−4 2	+6 54	+1 6
Starboard-steering	+8′ +·002	+31° 16′ +·549	+5° 14′ +·083	+5° 17′ +·094	+51′ +·014	·792	1·017	−4 51	+10 18	− 15
Port-steering ..	−18′ −·005	+31° 45′ +·558	−1° 32′ −·026	+5° 50′ +·101	−51′ −·014	·780	1·057	−5 14	+11 4	− 10
Main Deck	−1° 40′ −·209	+29° 4′ +·504	+7° 19′ +·119	3° 40′ ·063	−53′ −·016	·752	·038	−7 44	+11 21	−2 15

21. The small amount of the 𝔇, compared to that in the iron-built armour-plated ships of the Royal Navy, is remarkable. It is no doubt

to be attributed partly to the want of the transverse armour-plating at the extremities, and to the comparatively small number of bulkheads giving a smaller $-e$ than in the iron-plated ships of the Royal Navy, and partly to the armour-plating of the sides being continued on each side of the compass giving a large $-a$, and in this respect resembling the effect of the armour-plating in the Royal Oak class of ships in the Royal Navy.

22. The large amount of the heeling error in the Main-deck Compass and its direction is remarkable.

23. The 'Pervenetz' sailed for the Baltic on the 8th of August, 1863.

24. The only change in her magnetism on the voyage was an increase in the $+\mathfrak{C}$, which was no doubt owing to the starboard side being south.

25. The principal practical conclusions to be derived from the observations in the 'Pervenetz' seem to be,—

(1) That iron ships should be built head south.

(2) That in whatever direction an iron armour-plated ship is built, she ought to be placed in the opposite direction while plating, so as to reduce the semicircular deviation as much as possible. This results also from the observations made in the ships of the Royal Navy; but the plan of plating a ship in the opposite direction to that of building was first practised intentionally, and with the design of reducing the semicircular deviation, in the 'Pervenetz,' and, as will have been seen, with complete success.

(3) That great and rapid changes take place in the semicircular deviation some time after launching.

(4) The great amount of information both as to the semicircular deviation and the heeling error, which can be obtained by appropriate observations made while the vessel is building.

(5) The importance for this and other purposes, of reducing and recording the deviations of all iron ships, so as to obtain the values of the coefficients, and particularly λ and $\mathfrak{D}$, and to be able to estimate them in any new ship of the same class.

(6) The great importance of preparing a proper place for the reception of the Standard Compass in the construction of an iron ship.

III. "Notes of Researches on the Acids of the Lactic Series.—No. V. Action of Zinc upon a mixture of Ethyl Oxalate and Amyl Iodide." By Edward Frankland, F.R.S., and B. F. Duppa, Esq. Received March 30.

When a mixture of equivalent proportions of ethyl oxalate and amyl iodide is digested with granulated zinc at 70° C., the zinc is gradually dissolved, while much hydride of amyl and amylene are given off. The mixture finally assumes a viscous or semisolid condition, and, when treated with water, produces a further quantity of hydride of amyl, which distils